United States Court of Appeals

for the Second Circuit

EXHIBITS

76-7207

United States Court of Appeals

For the Second Circuit

Docket No. 76-7207

PRUDENTIAL OIL CORPORATION,

Plaintiff-Appellee,

vs.

PHILLIPS PETROLEUM COMPANY,

Defendant-Appellant.

ON APPEAL FROM THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK

(67 Civ. 3748 (C.L.B.))

EXHIBITS FOR JOINT APPENDIX

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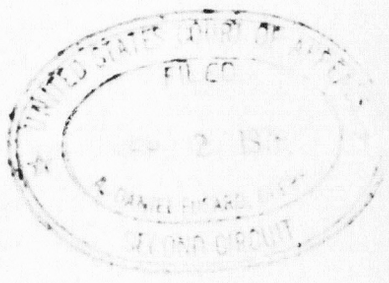

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E 1

USA 330-476
(REV. 4-22-71)
EXHIBIT
U. S. DIST. COURT
S. D. OF N. Y.
J-1

March 30, 1961

Economic Development Administration
Commonwealth of Puerto Rico
666 Fifth Avenue
New York, New York

Attention: Mr. J. Diaz-Hernandez,
Executive Director

Gentlemen:

This is to confirm our most recent discussions with you and Mr. Hector Vazquez relative to the possibility of our constructing an oil refinery of economically feasible capacities in order to complete present contracts and to effect future growth. At the present time we hold a letter of intention issued to us from Metropolitan Petroleum Corporation for an order covering the delivery of residual oil at the rate of 100,000 barrels per day for the term of one year. We have been verbally advised by Metropolitan Petroleum Corporation that should we so desire at the end of this contract, negotiations could be discussed towards renewing this contract. We further have been issued a letter of intention from Mr. J.M. Champe in Washington for an order covering delivery to New York Harbor of 92 octane to 94 octane gasoline at the rate of 50,000,000 gallons per year for the term of five years.

Through thorough and extensive investigations we have come to firmly believe that the construction of such a refinery would prove profitable and beneficial by placing the lighter ends in their strategic markets and the residual oils in their respective places. In our opinion Puerto Rico offers access to such markets because of its geographical location. The lighter ends could be directed through free trade of Latin America and Europe and the residual oils toward the existing markets along the Atlantic Seaboard of the United States which currently bear a deficit of 450,000 barrels per day. We are most cognizant of the fact that the United States Department of Interior has been very careful so as not to endanger

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4-10-72
BEST COPY AVAILABLE

the economic security of the United States oil industry. This has been accomplished by placing certain restrictions on all imported crudes. We do not desire to encroach upon these restrictions in any manner which might jeopardize the United States oil industry.

To accomplish such a vast undertaking on our part, it would be necessary to reach a mutual agreement between all parties concerned, namely; the United States Department of Interior, the Commonwealth of Puerto Rico and ourselves. We have learned through reliable sources in Washington, D.C. that the climate of opinion is favorable at this time to effect discussion of such an agreement. This ultimate agreement could best be attained through your acceptance of the validity and merit on our following proposals:

1. We must obtain a United States residual import certificate to enable us to meet our existing 100,000 barrels per day contract.

   (a) Under the conditions of this residual import certificate we would be permitted only to import residual crude into the available United States market.

2. We will endeavor to establish a free trade zone outside the United States on all lighter ends from the proposed refinery.

By enabling us through your assistance in accomplishing the granting of these above mentioned necessary privileges, we would then be in a position to instigate immediate negotiations toward the building of this oil refinery in Puerto Rico. It is our tentative plans that the capacity of this refinery would be 100,000 barrels per day at an approximate investment of $150,000,000.00. Although at present we are unable to disclose our financial plans and contacts here in the United States, we have definite verbal commitments for the financing of this project, subject to the granting of the residual import certificate.

At this time we wish to furnish you some general information concerning the main principals of our proposed venture:

MR. JESSE VERNON HOWELL
Residence: Statler Hilton Hotel, Dallas, Texas
Office: 9777 Harry Hines Blvd., Dallas, Texas
Business Associations:
President of Howell Oil Industries, Dallas, Texas

President of American Cities Trust Company,
Dallas, Texas
President of Pasadena Life of Texas, Houston,
Texas

MR. JOHN HOWELL GIBBS
Rresidence: Darby, Texas and 64 Colonial Drive
Huntington, New York
Office: 9777 Harry Hines Blvd., Dallas, Texas
Business Association:
Geologist of Howell Oil Industries, Dallas, Texas

MR. JOHN J. DRISCOLL
Residence: 916 Lindele Lane, Drexel Hill, Pennsylvania
Office: P.O. Box 62, Drexel Hill, Pennsylvania
Phone - SUnset 9-8600

Business Associations:
President of John J. Driscoll & Company, Inc.
Drexel Hill, Pennsylvania

Mr. Howell can be reached by phone at Riverside 7-2011, Dallas, Texas. Mr. Gibbs can be reached by phone at MYrtle 2-6042, Huntington, New York.

We feel that our present progress in reaching the ultimate goal of these proposals is real and encouraging. We further trust that with the information given herein we may have the wholehearted support of the Commonwealth of Puerto Rico and the other authorities so concerned.

May we take the liberty of expressing our gratitude for the many courtesies and assistance extended to the writer by your organization in the pursuit of this program.

Very truly yours,

s/John H. Gibbs
JOHN H. GIBBS

J-2, Letter from Irizarry to Gibbs, June 15, 1961

E 4

USA 23s - 475
(ED. 4-23-71)

EXHIBIT
U. S. DIST. COURT
S. D. OF N. Y.

J-2

FPI-NI—9-24-75-50M-4417

June 15, 1961

Mr. John H. Gibbs
2348 Poplar Road
Woodmere Manor
Havertown, Pennsylvania

Dear Mr. Gibbs:

Your mother-in-law, Mrs. O'Neill, has kindly provided us with your mailing address.

We have tried to get in contact with you over the telephone various times, however, we have been unsuccessful in doing so.

Please be advised that this Administration is willing to give you full support in your proposed project for the establishment of an oil refinery in the Commonwealth.

As we previously advised you, it is imperative that you prepare a prospectus of the proposed operation describing the land requirements, investment (both fixed capital and working capital), employment at start and potential employment, financing structure for the project, total production expectations of the different products to be produced, and the contribution of your project to the petro-chemical industry in Puerto Rico.

We would appreciate receiving your comments or instructions at your earliest convenience, so that we may continue the processing of your case.

Awaiting your early reply we remain

Very truly yours,

Ivan E. Irizarry,
Industrial Representative

IEI:ce

DEF. EX. 432-M
FOR ID. 9-10-73
HARVEY B. KRAMER

J-3, Preliminary Draft of Prospectus for Petrofina Puertorriquena, Inc., July 25, 1961

E 5.

USA 33s - 475
(ED. 4-23-71)

EXHIBIT
U. S. DIST. COURT
S. D. OF N. Y.

J-3

FPI-NI—9-24-75-50M-4417

DX-452

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Preliminary Draft of Prospectus dated July 25, 1961

E 6

Draft of Prospectus

As revised Sept. 21, 1961

PETROFINA PUERTORRIQUENA, INC.

$100,000,000—

6 1/2% Income Debentures, Due July 25, 1986

Sinking fund

General unsecured obligations representing all indebtedness of the Company other than indebtedness hereafter created which may by its terms be stated to be not senior. Interest will be cumulative but, until maturity, payable only to the extent of the Interest Net Income in each fiscal year. (See "Description of Income Debentures.")

SEC. DEPT. 452
WIT.
DATE 1-26-72

4,000,000 Shares

Common Stock, No Par Value

Offered in Units each consisting of a $100 principal amount 6 1/2% Income Debenture and four shares of Common Stock which will not be separately transferable until January 25, 1962, or at such earlier date as the Company may elect with the consent of Hornblower & Weeks.

There is presently no market for the Income Debentures or the Common Stock. The price to the public of the Units has been determined in negotiations between the Company and Hornblower & Weeks.

A registration statement relating to these securities will be filed with the Securities and Exchange Commission. Information contained herein is subject to completion or amendment. These securities may not be sold nor may offers to buy be accepted prior to the time the registration statement becomes effective. This prospectus shall not constitute an offer to sell or the solicitation of an offer to buy nor shall there be any sale of these securities in any State in which such offer, solicitation or sale would be unlawful prior to registration or qualification under the securities laws of any such State.

THESE SECURITIES HAVE NOT BEEN APPROVED OR DISAPPROVED BY THE SECURITIES AND EXCHANGE COMMISSION NOR HAS THE COMMISSION PASSED UPON THE ACCURACY OR THE ADEQUACY OF THIS PROSPECTUS. ANY REPRESENTATION TO THE CONTRARY IS A CRIMINAL OFFENSE.

	Price to Public	Underwriting Discounts or Commissions (1)	Proceeds to Company (2)
Per Unit			
Total			

(1) The underwriting Agreement contains reciprocal agreements of indemnity between the Company and the Underwriters as to certain liabilities relating to the Registration Statement and the Prospectus. The Company will pay an aggregate fee of $100,000 to Hornblower & Weeks, as compensation for financial services and advice and for services in placing the Subordinated Income Debentures of the Company.

(2) Before deducting other expenses payable by the Company, estimated at approximately $

The Units are offered by the several Underwriters named herein subject to prior sale, when, as and if issued and accepted by the Underwriters, subject to approval of certain legal matters by Javits and Javits, as counsel for the Company, Milbank, Tweed, Hope & Hadley, as counsel for the Underwriters. It is expected that delivery of the Units will be made at the office of Hornblower & Weeks, 400 Madison Avenue, New York 17, New York, on or about October , 1961 against payment therefor in New York funds.

Among the principal underwriters named herein under the caption "Underwriting" is

HORNBLOWER & WEEKS

The Date of this Prospectus is July 25, 1961

No dealer, salesman or any other person has been authorized to give any information or to make any representation, other than those contained in this Prospectus, in connection with the offer contained in this Prospectus, and if given or made, such information or representation must not be relied upon as having been authorized by the Company or by any of the Underwriters. Neither the delivery of this Prospectus nor any sale made hereunder shall, under any circumstances, create an implication that there has been no change in the affairs of the Company since the date hereof. This Prospectus does not constitute an offer by the Company or by any Underwriter to sell securities in any state to any person to whom it is unlawful for the Company or such Underwriter, respectively, to make such offer in such state.

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Petrofina Puerterriquena, Inc. (herein sometimes referred to as the "Company") will file with the Securities and Exchange Commission, Washington, D.C., a Registration Statement (herein together with all amendments thereto called the "Registration Statement") under the Securities Act of 1933, as amended, with respect to the securities offered hereby. For further information reference is made to the Registration Statement and the exhibits thereto. The statements in this Prospectus as to the contents of any contract or other document of which a copy is filed as an exhibit to the Registration Statement are qualified by reference to such contract or other document.

IN CONNECTION WITH THIS OFFERING, THE UNDERWRITERS MAY OVER-ALLOT OR EFFECT TRANSACTIONS WHICH STABILIZE OR MAINTAIN THE MARKET PRICE OF THE UNITS AND THE COMMON STOCK OF THE COMPANY AT LEVELS ABOVE THOSE WHICH MIGHT OTHERWISE PREVAIL IN THE OPEN MARKET. SUCH STABILIZING, IF COMMENCED, MAY BE DISCONTINUED AT ANY TIME.

Petrofina Puertorrigina, Inc. was organized as a Puerto Rico corporation on . From that date until the present its operations have been solely concerned with securing an import allocation of 100,000 barrels of crude oil per day to be processed at into petrochemical feed stocks. The company maintains executive offices in New York City at , and its proposed refinery will be located at . The company is authorized to transact business throughout the United States and the Caribbean and Latin American areas. The company is not at present in production. The proposed funds are for the construction of a fully integrated refinery to produce major organic chemicals from crude oil. It is proposed that the oil will be secured from Venezuela, and that the basic chemicals to be refined will be methyl alcohol, isopropyl alcohol, formaldehyde, butadiene, acetone, industrial ethyl alcohol, benzene, and glycerine.

It is proposed that these materials will be sold to major chemical companies. It is expected that these companies will be induced to establish processing facilities in Puerto Rico, thereby helping to improve the general Puerto Rican economy. Companies which are expected to be major customers for Petrofina include Monsanto Chemical Company, Rohm & Haas Company, Dow Chemical Company, E. I. du Pont de Nemours & Company, Union Carbide Chemicals Company, American Cyanamid Company, Allied Chemical Corporation, and Hercules Powder Company.

It is difficult to estimate the profit potential of the company. It is known, however, that the petrochemical industry has grown from less than 5,000,000 metric tons in 1945 to over 25,000,000 metric tons in the current year, and that this rate of growth is expected to accelerate in future years. In addition, the petrochemical segment of the oil refining industry is regarded as the most highly profitable and progressive area of petroleum development.

The pro forma statements prepared as part of this prospectus are based on the best available management knowledge of the industry today. There are no oil refining companies in existence today whose basis of operation is entirely petrochemical. Therefore, there is no known basis for comparing the estimated operation of this company with that of any existing company.

The company has no exclusive rights or patents. It faces severe competition from well established and well integrated producing companies.

The 1,000,000 Units offered hereby each consist of (a) one $100 principal amount of 6 1/2% Income Debenture due , and (b) four shares of Common Stock.

The Income Debentures to be issued to purchasers of the Units will be in fully registered form and will bear an endorsement stating that the Common Stock constituting a part of the Units has been deposited with, and is held in trust by, Bankers Trust Company, as depositary, subject to and in accordance with the terms of a Deposit Agreement (a copy of which is filed as an exhibit to the Registration Statement). The Deposit Agreement will provide that the deposit shall terminate on or such earlier date as the Company may elect with the consent of Hornblower & Weeks, and that as soon as practicable thereafter the depositary will mail to the registered owners of record at the close of business on the date of such termination certificates representing the shares of Common Stock held for the benefit of such owners.

Under the terms of the Deposit Agreement, prior to the date of termination of the deposit (or as to any Income Debenture which shall be redeemed, its redemption date), the Units will be transferable only as a whole, the beneficial ownership of the shares contained therein being transferable only by transfer of the Income Debentures and any such transfer shall constitute a transfer of the holder's beneficial interest in the related shares of Common Stock. By accepting an Income Debenture the holder shall be bound by all the terms and provisions of the Deposit Agreement. Pursuant to the Deposit Agreement, the registered owners of the Income Debentures will be entitled to receive from the depositary proxies to vote the shares of Common Stock held in trust at any meeting of stockholders.

The Company will pay any stamp taxes or any other governmental charges upon the issue and sale of the Common Stock under the Deposit Agreement, and also upon the delivery of separate certificates for Common Stock, to the registered owners of the Income Debentures, as well as all the expenses of the depositary. Any stamp taxes or any other governmental charges arising from the transfer by an owner of an Income Debenture of his beneficial ownership in the Common Stock will be borne by such owner.

The additional 6,000,000 shares of Common Stock of the Company will be available for sale to the general public with the exception of 100,000 shares which will be withheld in the Company Treasury for use as options to corporate officers.

The financing program described herein is being undertaken by the Company in order to provide the funds necessary for a fully integrated petrochemical plant. The amount provided by this financing is expected to be all that will be required for presently contemplated operations.

APPLICATION OF PROCEEDS

The aggregate net proceeds (after expenses, including underwriting commissions, of approximately $) to the Company from the sale of the Units offered hereby will be approximately $. Of such proceeds, $6,500,000, equal to one year's interest requirement on the Income Debentures, will be deposited in escrow and, to the extent that earnings of the Company available for the payment of interest on the Income Debentures may be insufficient for payment of interest accrued to any interest payment date or dates to and including July 25, 1963, such deposit will be applied to the payment of such accrued interest on such interest payment date or dates unless such payment is prevented by the subordination provisions of the Indenture. Of the balance of such net proceeds at $ and $, respectively, approximately $ will be applied to defray the estimated cost of construction of the Project and the balance of $ will be added to the Company's general funds for working capital and other corporate purposes including the payment of interest during the construction period if required. Details as to the cost of the Project and the working capital required therefor are set forth under "Petrochemical Products - Proposed Petrochemical Plant".

As indicated under "Bond Purchase Agreements", the sale of the Bonds is contingent upon the fulfillment of certain conditions, including, among others, (i) the delivery to the purchasers of the Bonds of a report by an independent firm of engineers to the effect that the Project has been satisfactorily completed, is in good operating condition and is producing products meeting the specifications therefor in the Company's contracts with major customers, (ii) that specified quantities of products shall have been delivered pursuant to these Contracts, and (iii) that the net working capital of the Company, after giving effect to the sale of the Bonds, shall not be less than $20,000,000. Failure to sell the Bonds because one or more of the conditions to such sale are not satisfied would constitute a default under the Debenture Indenture and the Company is unable to forecast the extent to which it could obtain waivers of any such default or make satisfactory substitute financial arrangements. The Company believes that the conditions to the sale of the Bonds will be met, although some of the conditions depend upon action to

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be taken by persons other than the Company and their satisfaction, therefore, is not entirely within the control of the Company. It is expected that the working capital required to satisfy the condition referred to above, available from the proceeds of the financing, may be partially derived from cash generated from the operations of the Company during the estimated two-year construction period. Any additional funds required either in connection with the Project or expansion of the Company's operations may be raised through the issuance of additional debt or equity securities the nature and manner of which cannot be determined at this time.

PRICE RANGE OF COMMON STOCK - DIVIDENDS

There is at present no market for the Company's stock. The company is not in operation. There is, consequently, no dividend record.

CAPITALIZATION

Proposed capitalization and amounts of securities outstanding of the Company on a consolidated basis as of September 1, 1961 and as adjusted to reflect completion of the financing program described under "Financing Program" are as follows:

Title of Issue	Authorized	Outstanding as of Sept. 1961	Outstanding Upon Completion of Financing
6 1/2% Income Debentures	$100,000,000	None	$100,000,000
Common Stock (no par value)	10,000,000 shs.	None	4,000,000 shs.

SUMMARY OF EARNINGS

The Company has no earnings, and will not have any until an import allocation has been granted, or until the facilities are operable, or both.

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OPERATIONS

(Data being Prepared - Not Yet Available)

PETROCHEMICAL PRODUCTS AND PROPOSED PETROCHEMICAL PLANT

(Data being Prepared - Not Yet Available)

COMPETITION

(Data being Prepared - Not Yet Available)

Pages 8, 9, & 10 to come

EMPLOYEE RELATIONS

The Company has no employees other than those who have agreed to serve as corporate officers and directors. It will be the policy of the company to establish and maintain an employee relations department according to the highest standards established in the United States, and to maintain such employment policies as to minimize internal friction and provide maximum efficiency at minimum labor cost.

DESCRIPTION OF INCOME DEBENTURES

The Income Debentures are to be issued under an indenture (the Indenture) to be dated , between the Company and Bankers Trust Company as Trustee. The Income Debentures are to be limited to $100,000,000 principal amount; will mature July 25, 1985 and will bear interest from date of issue at the annual rate set forth on the cover page, payable semiannually on January 25 and July 25 in each year. Interest is to be paid only to the extent earned in the fiscal year ended the preceding April 30 as discussed hereinbelow under the caption "Payment of Interest". Principal of, and premium, if any, and interest on the Income Debentures will be payable at an office or agency of the Company in New York, New York.

The Income Debentures will be issued in registered form in denominations of $100 and any multiple thereof and will bear the endorsement and will represent Common Stock of the Company until termination of the Deposit Agreement as set forth under "Offering of Units".

Redemption Provisions

The Income Debentures will be redeemable, at the Company's option, as a whole or in part at any time, on not less than thirty (30) days published notice at the following redemption prices (expressed in percentages of the principal amount thereof), together, in each case, with interest accrued to the date fixed for redemption, if redeemed during the 12 months period beginning January 25:

1962	106.50%	1975	102.98%
1963	106.23%	1976	102.71%
1964	105.96%	1977	102.44%
1965	105.69%	1978	102.16%
1966	105.42%	1979	101.89%
1967	105.15%	1980	101.62%
1968	104.88%	1981	101.35%
1969	104.61%	1982	101.08%
1970	104.33%	1983	100.81%
1971	104.06%	1984	100.54%
1972	103.79%	1985	100.27%
1973	103.52%	1986	100.00%
1974	103.25%		

The Income Debentures will also be redeemable on like notice for the Sinking Fund described below on and on each thereafter through at 100% of the principal amount thereof together with accrued interest to the date fixed for redemption. (Article Five.)

Contingent Sinking Fund

The Indenture will provide that on or before January 25 in each of the years through the Company will pay to the Trustee, as a contingent Sinking Fund Payment, an amount in cash equal to 50% of net earnings for the fiscal year ended the preceding April 30 in excess of $2,000,000 but in no event more than $5,000,000 principal amount of Income Debentures plus any arrearages for previous years in order to retire 100% of the issue by the stated maturity if all contingent Sinking Fund Payments are met. The redemption price for the contingent Sinking Fund is to be 100% plus accrued interest. Non-payment of the contingent Sinking Fund does not constitute a default under the Indenture in the event there are insufficient earnings available for such purpose.

Escrow of Interest

Since the Project is not expected to be completed until the Spring of 1963, the Company will, under an Escrow Agreement, deposit in escrow $6,500,000, equal to one year's interest requirement on the Income Debentures, for the payment of interest on the Income Debentures to the extent Interest Net Income may be insufficient in the fiscal years ending 1962, 1963, and 1964. (Article Three.) See "Application of Proceeds" for related information.

Payment of Interest

Interest is to accrue on the Income Debentures at the rate per annum stated on the cover page of this Prospectus and is payable on the 25th day of January and July in each year but only to the extent of the Interest Net Income, if any, of the Company for the fiscal year ending in the preceding calendar year (or, if the Company has outstanding indebtedness with substantially similar provisions as to payment of interest, that portion of Interest Net Income which interest due on the Income Debentures in the particular year bears to such interest plus the interest due on such other indebtedness). Any unpaid interest is cumulative and shall become due and payable upon the next succeeding interest payment date to the extent that Interest Net Income of the preceding fiscal year is sufficient and, to the extent not theretofore paid, it shall become due and payable in any event whenever the principal of any of the Income Debentures becomes due and payable, whether by declaration, upon redemption, at maturity, or otherwise. (Article Three.)

The Indenture defines Interest Net Income for any fiscal year as the gross income for such fiscal year of the Company and its subsidiaries on a consolidated basis plus any balance on deposit in escrow described above, less all operating expenses and other proper charges to income for such fiscal year, including accrued interest (other than interest on the Income Debentures) on all outstanding indebtedness, amortization of all deferred charges properly subject to amortization (except amortization of debt discount), provisions for contingency reserves, depreciation, retirements and obsolescence, but before deduction for accruals or payments of income and excess profit taxes or of any other taxes which are imposed on income after deduction of interest charges. In computing Interest Net Income profits realized or losses sustained from the sale or other disposition of investments or fixed assets, including timber lands and standing timber owned by the Company or any Consolidated Subsidiary are excluded. (Article One.)

Events of Default and Notice Thereof

The following events are defined in the Indenture as "events of default": failure to pay principal when due and payable at maturity, by redemption or otherwise; failure to pay interest when due and payable for 30 days; failure to perform any other covenants in the Indenture for 90 days after notice; certain events of bankruptcy, insolvency or reorganization.

The Indenture provides that the Trustee shall, within 90 days after the occurrence of a default, give to the debentureholders notice of all uncured defaults known to it (the term default to include the events specified above without grace periods and irrespective of any notice); provided, that, except in the case of default in payment of principal or interest or any Sinking Fund installment, the Trustee shall be protected in withholding such notice if it in good faith determines that the withholding of such notice is in the interests of the debentureholders.

The Company must furnish to the Trustee within 120 days after the end of each fiscal year a statement of certain officers of the Company as to whether they have obtained knowledge of any default in the performance of agreement or condition contained in the Indenture, and, if so, specifying each such default.

The holders of a majority of the principal amount of the outstanding Income Debentures have the right to direct the time, method, and place of conducting any proceeding for any remedy available to the Trustee, or exercising any trust or power conferred on the Trustee (subject however to their making offer of satisfactory indemnity to the Trustee), except as otherwise provided in the Indenture.

Modification of the Indenture

The Indenture and the rights of debentureholders may be modified by the Company and the Trustee with the consent of the holders of 66 2/3% in aggregate principal amount of the Income Debentures then outstanding; but no modification of the terms of payment of principal or interest or Sinking Fund and no modification reducing the percentage required for modification will be effective without the consent of the holders of all Income Debentures so affected or then outstanding, respectively.

DESCRIPTION OF COMMON STOCK

Transfer Agent and Registrar

Morgan Guaranty Trust Company of New York is the Transfer Agent and Bankers Trust Company, New York, N.Y. is the Registrar for the Common Stock.

Dividend Rights

Subject to the restrictions upon declaration and payment of dividends contained in the Indenture, the Bond Purchase Agreements, the

holders of the Company's Common Stock share ratably in, and are entitled to receive, dividends from the net earnings of the Company or from the surplus of its assets over its liabilities when and as declared by the Board of Directors pursuant to, and in compliance with, the laws of the Commonwealth of Puerto Rico.

Liquidation Rights

Upon liquidation, the holders of Common Stock will be entitled to share ratably in the assets available for distribution to stockholders.

Voting Rights

The holders of the Company's Common Stock have exclusive voting rights, each share being entitled to one vote.

Non-Cumulative Voting

The Common Stock has non-cumulative voting rights which means that the holders of more than 50% of the shares voting for the election of directors can elect 100% of the directors if they choose to do so, and, in such event, the holders of the remaining less than 50% of the shares voting for the election of directors will not be able to elect any person to the Board of Directors.

Preemptive Rights

Holders of shares of Common Stock do not have any preemptive or other preferential subscription rights.

Miscellaneous

The shares of Common Stock offered hereby will, when issued, be fully paid, non-assessable and with no liability to further calls. No conversion rights or redemption or sinking fund provisions are applicable to the Common Stock.

BOND PURCHASE AGREEMENTS

The Company has entered into Bond Purchase Agreements dated as of with institutional investors (the Purchasers) for the purchase upon completion of the Project of aggregate principal amount of Bonds. The Bond Purchase Agreements are identical

except for the name of the Purchaser and the amounts of the Bonds to be purchased by each. The following is a brief summary of certain of the provisions of such Agreements.

The Bonds will mature and will bear interest at 6 1/2% per annum payable semi-annually on July 25 and January 25. The Bonds will be issued under and secured by an Indenture of Mortgage and Deed of Trust (the Mortgage), in substantially the form attached as an exhibit to the respective Bond Purchase Agreements.

The Company must pay the Purxhasers on the Bond Closing Date (as hereinafter defined) a commitment fee of 1/2 of 1% per annum (for the period to the Bond Closing Date) on the principal amount of the Bonds to be purchased.

The Bond Closing Date shall be such date, not earlier than and not later than (unless extended a maximum of six additional months by events of force majeure) as the Company shall designate by 30 days notice in writing; the Bond Closing Date, however, shall not be earlier than 30 days after the date of completion of the Project as stated in the Completion Report referred to below.

The Bond Purchase Agreements become effective simultaneously with the issue and sale of the Units subject, however, to the fulfillment of the following principal conditions at or prior thereto:

(i) The securities offered hereby shall have been duly issued and sold for the consideration specified herein and all of the Unsecured Notes shall have been issued and sold, and the Stock Purchase Warrants shall have been duly executed and delivered, pursuant to the Unsecured Note Agreements;

(ii) The Purchasers shall have received a certificate or letter of a firm of independent engineers principally to the effect that (a) the Construction Contract requires the use of good engineering practices and generally accepted construction procedures, (b) if the Project is constructed in accordance with the Construction Contract (and assuming sound management and good operating personnel and procedures) the Project will be capable of sustained production of the several products of the quality and at the annual rates referred to above under "Petrochemical Products" and contemplated in the Project engineering reports and (c) the physical facilities comprising the water supply system for the Project will be capable of delivering water sufficient for such sustained production and the effluent disposal system is feasible and will accommodate mill effluent for not less than 25 years after completion of the Project;

(iii) The Purchasers shall have received a certificate of to the effect that, based upon a review of data relating to all water wells drilled in the Project area since (and data since from wells previously drilled in such area), nothing has come to the attention of such firm which would cause it to change its prior opinion (as above referred to) and further that the well system for the Project, when completed in accordance with the Construction Contract, will be capable of production of at least 8,000,000 gallons of water for not less than 25 years after completion of the Project; and

(iv) The Purchasers shall have received favorable opinions of counsel in respect to various legal matters including the title to properties and the lien of the Mortgage.

The Bond Purchase Agreements obligate the respective Purchasers to purchase the Bonds on the Bond Closing Date upon satisfaction of various conditions at or prior thereto; the principal conditions are:

(i) The purchase price for the Bonds shall, simultaneously with the purchase thereof and to the extent required therefor, be applied to the payment of all the issued and outstanding Interim Notes;

(ii) The Company shall have caused to have been delivered to the Purchasers a report (the Completion Report) of an independent firm of engineers of recognized standing expressing the opinion of such firm to the effect that the Project (a) has been completed in accordance with the plans and specifications and good engineering practice and generally accepted construction procedures and in compliance with the Construction Contract, (b) is in good operating condition, and assuming sound management, good operating personnel and procedures and continuing availability of adequate water, is capable of sustained production of the several products referred to in, and at the respective annual rates, grades and qualities contemplated by the Project engineering reports, (c) without regard to the underground supply of water, the water supply facilities are in good operating condition and have the capacity to deliver gallons of water per day to the refinery, and (d) is producing products which meet the specifications therefor in the customer Contracts. The Completion Report must state a date on or prior to which the Project was so completed, and must summarize the investigation made as the basis for such opinion. For the purposes of such Completion Report, the Project may not be deemed to have been completed until not less than tons of products have been delivered pursuant to the Contracts and the Company shall have caused to have been delivered to the Purchasers a statement from the firm engineers to the effect that not less than tons of products delivered under the Contracts have been satisfactorily and to specification;

(iii) The Consolidated Net Working Capital of the Company and its domestic subsidiaries, determined as provided in the Mortgage and giving effect to the sale of the Bonds and the application of the proceeds thereof, shall not be less than ;

(iv) That the Company shall have performed all agreements required by the Bond Purchase Agreements to be performed on or prior to the Bond Closing Date;

(v) That the Company, after giving effect to the sale of the Bonds and application of the proceeds thereof, shall not be in default under the Mortgage and, from the date of the Bond Purchase Agreements to the date of purchase, shall have complied (with certain exceptions) with Sections through of the Mortgage (being, most importantly, the restrictive covenants discussed herein under "The Mortgage") as if it had been in effect throughout such period;

(vi) No amendments or modifications (other than those approved by the Purchasers and the Agent under the Interim Loan Agreement) of the Mortgage, the Interim Loan Agreement, the Unsecured Note Agreements and the Stock Subscription Warrants executed and delivered in connection therewith, the Indenture, the Warrant Agreements, the Customer Contracts, and certain other agreements shall have been made and such instruments shall be in full force and effect and the Company shall not be in default thereunder;

(vii) There shall have been delivered to the Trustee under the Mortgage policies of title insurance covering title to all of the lands, easements, rights of way and other interests acquired from private parties for the Project;

(viii) The Petrochemicals Purchase Mortgage shall have been amended so as to restrict the lien thereof to property of the Company then subject to such lien (including improvements and accessions thereto);

(ix) All Purchasers shall purchase simultaneously the Bonds to be sold to them under the Bond Purchase Agreement; and

(x) That counsel for the Company and the Purchasers shall have given their favorable opinions as to the legal matters involved in the purchase of the Bonds including the title to properties and the lien of the Mortgage.

After the Bond Purchase Agreements become effective and until the Bond Closing Date, the Company is obligated to maintain Consolidated Net Working Capital in an amount of at least $.

THE MORTGAGE

The Bonds are to be issued under and secured by an Indenture of Mortgage and Deed of Trust with Bankers Trust Company of New York as Trustee, which will be a lien upon substantially all mortgageable property of the Company owned on, or acquired after, the date of execution of the Bond Purchase Agreements.

Sinking Fund

The Company is obligated under the Mortgage to make annual Sinking Fund payments on in each year commencing . Such payments will amount to in each year from through , leaving a balance of due at maturity. The Bonds will be callable for sinking fund purposes on 30 days' notice at 100% plus accrued interest.

Redemption Provisions

The Bonds will be subject to redemption at the option of the Company at their principal amount and accrued interest plus an initial premium of prior to and thereafter at premiums declining in approximately equal amounts each year to zero on and after provided, however, that no such redemption may be carried out prior to directly or indirectly as a part of, or in anticipation of, any refunding operation involving the incurring of indebtedness having a net interest cost to the Company of less than per annum.

Restrictions on Sale, Merger or Consolidation

The Mortgage will prohibit the Company from consolidating with, merging into or disposing of all or substantially all of its property to, another person unless the successor shall have assumed all of the covenants relating to the Bonds.

Events of Default

The Mortgage will provide that the following are Events of Default: (i) default in the payment of interest continuing for 30 days, (ii) default in the payment of principal (including premiums), (iii) default in a Sinking Fund obligation, (iv) default in the performance of certain covenants continuing for thirty days including covenants imposing financial

restrictions described above and covenants to complete the Project by , (v) invalidity or abandonment by the Company of the Customer Contracts or related agreements, (vi) certain events of bankruptcy, insolvency, or reorganization and (vii) acceleration of other Indebtedness.

Upon the happening of the Event of Default, the Trustee or the holders of 25% of the Bonds may accelerate the Bonds, the Trustee may take over the Company's business and exercise a right of sale over the Company's mortgaged properties.

MANAGEMENT & CONTROL

(Data Being Prepared - Not Yet Available)

UNDERWRITING

The Underwriters named below, through their Representative, Hornblower & Weeks, have severally agreed, subject to the terms and conditions contained in the Underwriting Agreement (a copy of which is filed as an exhibit to the Registration Statement), to purchase from the Company the following respective number of Units offered hereby:

Name	Address	No. of Units
Merrill Lynch, Pierce, Fenner & Smith, Inc.	70 Pine Street, New York, N. Y.	

(OTHERS TO BE ARRANGED AS REQUIRED)

The nature of the underwriting agreement is such that if any of the Units offered hereby are purchased, all of such Units must be purchased.

The Company is advised by Hornblower & Weeks, as Representative of the several Underwriters, that the Underwriters propose to offer the Units, subject to prior sale, when, as and if issued by the Company and accepted by the Underwriters, in part directly to the public at the initial public offering price set forth on the cover page of this Prospectus and in part to certain dealers at such price less a concession of $ ¢ per Unit; that the Underwriters may allow and such dealers may reallow on sales to certain other dealers a discount of not exceeding $ ¢ per Unit; and that after the initial public offering of the Units offered by this Prospectus, the Representative is authorized to change the public offering price and concessions and discounts to dealers.

Copies of the Agreement Among Underwriters and the Selected Dealers Agreement have been also filed as exhibits to the Registration Statement and reference is hereby made to them for further information concerning the underwriting arrangements.

LITIGATION

Except for routine litigation incident to the inception of its business, the Company is not a party to any material pending legal proceeding.

AUDITORS' REPORT

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(To Be Provided)

PRO FORMA FINANCIAL STATEMENT

(In Preparation)

LEGAL OPINIONS

The legality of the securities included in the Units offered hereby will be passed upon for the Company by Javits and Javits, New York, New York, General Counsel for the Company, and for the Underwriters by Milbank, Tweed, Hope and Hadley, New York, New York, who, as to all matters of Puerto Rican law may rely on
Both such firms, as to all matters of Puerto Rican law, may rely on

EXPERTS

The pro forma financial statements and supporting schedules included in this Prospectus or elsewhere in the Registration Statement, have been examined by and have been included herein in reliance upon the authority of these firms as experts in accounting and auditing in giving such opinions and reports.

The statements in this Prospectus concerning water supply and waste disposal in connection with the Project have been reviewed by . Such statements are included herein in reliance upon the authority of such firm as an expert.

ADDITIONAL INFORMATION

This Prospectus does not contain all the information set forth in the Registration Statement, certain portions of which have been omitted pursuant to the rules and regulations of the Securities and Exchange Commission. For further information with respect to the Company and the Units offered hereby reference is made to such Registration Statement and the exhibits and schedules filed therewith.

PETROFINA PUERTORRIQUENA, INC.

President

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J-4, Agreement Letter, Omega to Universal Oil Products Company, September 12, 1961

J-4
Conformed copy

September 12, 1961

Mr. J. P. Coan
Omega Management Co.
230 Park Avenue
New York City, N.Y.

Dear Mr. Coan:

In accordance with the discussions held with you this day, we are pleased to enclose herewith three (3) copies of our share form letter agreement (MRAB-6-60) relating to MOP Project No. 77250 covering a study of a proposed refinery and petrochemical raw material manufacturing complex.

As discussed with you, we estimate that we will be able to perform the study evaluation based upon a typical Venezuelan crude oil shares stock and to estimate the capital cost, process scheme, and operating cost of the installation for two alternative cases as follows:

A. Producing normal petroleum refinery products.

B. Producing normal petroleum refinery products while at the same time maximizing the output of petrochemical raw materials and intermediates.

In performing this study, we will use our best judgment in determining the [al]requirements, operating cost and [ing]capital necessary to the project. We will, in addition, calculate the indicated economics and total cash throwoff assuming the following limitations discussed with you:

Conformed copy

(1) No income or property tax due from the project for ten years.

(2) Normal depreciation rates.

(3) 20% equity capital
80% convertible sinking fund debentures,
6% interest rate, 20 year term.

We estimate that we will be able to complete this study and render to you a report of same by October 17, and that the total cost to you for our performance of the study will amount to from $3,000 to $5,000.

We trust the above is in accordance with your understandings in this matter and if so, will you please execute two (2) copies of the enclosed letter agreement and return them to us whereupon we will have both copies executed and return to you one(1) copy and as many conformed copies as may be required.

In order to mail this letter to you today, we have omitted the outline and discussion of the additional services which Universal is in a position to provide after the first part of this work, as discussed above, is complete. We will furnish this information to you in a subsequent letter and in further discussions.

In the meantime, we will proceed with the initial work required. We look forward to the opportunity of serving you in this matter.

Yours very truly,

UNIVERSAL OIL PRODUCTS COMPANY

S. W. Curry

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UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD ⬡ DES PLAINES, ILLINOIS, U.S.A.

September 12, 1961

Omega Management Co.
230 Park Avenue
New York City, N.Y.

U.O.P. Project No.

77250

Dear Sirs:

In accordance with your request as per our verbal discussions of this date,

we agree to render to you certain services as set forth in Schedule A attached hereto upon the terms and conditions set forth on the reverse side hereof.

Will you please sign and return the enclosed copy of this letter-agreement as your confirmation thereof and to assure that we have set forth correctly the services requested by you. If you have any question or desire any change with respect to the foregoing will you please promptly advise us.

For reference purposes we have assigned the Project number to the aforesaid services as shown in the subject hereof and in said Schedule A.

Very truly yours,

UNIVERSAL OIL PRODUCTS COMPANY,

By

CONFIRMED:

OMEGA MANAGEMENT CO.

(CLIENT)

By

(Title)

Date:

MRAE-4-60

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J-5, Agreement Letter, Omega to Universal Oil Products Company, September 12, 1961

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TERMS AND CONDITIONS

NONDISCLOSURE AND RESTRICTION ON USE

1. CLIENT will use its best efforts to prevent duplication or disclosure of data, plans, specifications, flow sheets and drawings furnished directly or indirectly, in writing or otherwise, to CLIENT by UNIVERSAL under this agreement except that such information may be disclosed as may be necessary to CLIENT's employees, bona fide consultants and other companies with whom CLIENT may be considering joint operations and who shall agree to keep such information confidential. Neither UNIVERSAL's name nor the reports prepared hereunder shall be used in connection with any prospectus or Securities Registration Statement which may be filed by CLIENT with any governmental agency without the express written consent of UNIVERSAL.

CHARGES AND PAYMENTS

2. (a) CLIENT will, within twenty (20) days after submission of UNIVERSAL's invoices therefor, pay to UNIVERSAL a sum equal to the cost of all work and services performed by UNIVERSAL hereunder during each calendar month. Included in the determination of such cost, but not by way of limitation, shall be: all direct expenses such as blueprints, engineering and drafting supplies, postage, telegraph, telephone, transportation and living expenses of UNIVERSAL's employees while engaged in services rendered at points other than at UNIVERSAL's home office or laboratories, and all similar expenses directly incurred in connection with such work and services; the salaries or wages allocated for the actual time of UNIVERSAL's employees engaged in such work and services; and an amount in respect of UNIVERSAL'S overhead and indirect expenses which shall be determined as a percentage of such salaries and wages, such percentage to be the same as that applied by UNIVERSAL for similar services being performed at the time in question by UNIVERSAL for others under similar conditions and on substantially the same terms as this agreement. CLIENT will pay to UNIVERSAL, in addition to the aforesaid cost, a fee equal to [illegible] per cent (100%) of the aforesaid salaries and wages, overhead and indirect expenses.

(b) All charges and payments herein specified refer to lawful money of the United States and all payments to be made by CLIENT hereunder shall be paid at the office of UNIVERSAL in amounts to be calculated and established at the time payments are due so that, after deduction for any taxes, assessments and charges levied, assessed or imposed, other than by the Government of the United States of America, which CLIENT or UNIVERSAL or any other party shall be required to pay or withhold in respect to such payments, the remainder actually paid to, and received by, UNIVERSAL shall be the amounts as set forth herein.

FORCE MAJEURE

3. UNIVERSAL shall not be liable for failures and delays in performance due to any cause or circumstance beyond UNIVERSAL'S control, including, without thereby limiting the generality of the foregoing, any failures or delays in performance caused by strikes lockouts, fires, acts of God or the public enemy, riots, incendiaries, interference by civil or military authorities, compliance with the laws of the United States or with the orders of any governmental authority, delays in transit or delivery on the part of transportation companies or communication facilities, or any failure of sources of material.

RESPONSIBILITY AND LIABILITY

4. UNIVERSAL warrants that the work and services to be performed by it hereunder shall be performed in accordance with generally accepted standards of engineering and economic research; provided, however, that (1) UNIVERSAL's liability for breach of said warranty shall not in any event exceed the amount of the fee payable under paragraph (a) of Article 2 of these Terms and Conditions, (2) UNIVERSAL shall not be liable for any consequential or indirect damages arising out of the work and services performed by it hereunder, (3) since the reports rendered hereunder will be based in part upon information obtained from CLIENT and from possible other sources not subject to complete confirmation, UNIVERSAL cannot give any warranty or guaranty with respect to the contents of said reports which are in any way based upon or derived from such information, and (4) UNIVERSAL makes no warranty or guaranty with respect to the results which CLIENT obtains in reliance upon UNIVERSAL'S recommendations as contained in the reports.

GENERAL PROVISIONS

5. The agreement herein contained constitutes the entire agreement between the parties and the parties agree that there are no prior representations, warranties or agreements relating thereto. No change in, addition to, or waiver of the terms and provisions hereof shall be binding upon UNIVERSAL unless approved in writing by its authorized representative and no modification shall be effected by the acknowledgment or acceptance of purchase order forms containing other or different terms or conditions.

6. The services rendered hereunder by UNIVERSAL shall not be construed to grant any rights whatsoever, express or implied, under any of UNIVERSAL's patent rights in addition to those that CLIENT is now or may become entitled to under any other agreements.

7. The agreement herein contained shall become effective when a copy hereof signed by CLIENT is received by UNIVERSAL and shall be construed and the legal relations between the parties hereto shall be determined in accordance with the laws of the State of Illinois.

M&AE (---)

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Conformed Copy

SCHEDULE A

SERVICES TO BE RENDERED

Project No. 77250

To perform a study and prepare a report of the results of an economic feasibility evaluation of a refinery to be located in Puerto Rico. The refinery is to process 100,000 barrels per day of a typical Venezuelan crude mix and to produce a normal refinery fuel product as well as the maximum feasible quantity of petrochemical raw materials and intermediates.

Basic assumptions as to processing scheme, product mix to be produced, labor and wage rates, utilities costs, erected costs, yields and other factors pertinent to the study are to be provided by Universal based upon their experience and know-how in this field.

J-6, Swain to Coan, October 13, 1961

DX-410-B 7/6/73

UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD DES PLAINES, ILLINOIS, U.S.A.

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October 13, 1961

Mr. J. P. Coan, President
Omega Management Incorporated
230 Park Avenue
New York 17, New York

Dear Mr. Coan:

Enclosed are five (5) copies of our report entitled "Processing and Economic Data for a Proposed Puerto Rico Refinery" dated October, 1961 as per contract between Omega Management Incorporated and Universal Oil Products Company, dated September 12, 1961.

We believe this study will act as an aid in the investigation of the general economics of a proposed 100,000 barrels per day refinery located in Puerto Rico that will produce normal petroleum fuels as well as the maximum feasible quantity of petrochemical raw materials and intermediates.

The contents of this report we believe in the most part to be self-explanatory. However, after you have had an opportunity to inspect this report, we look forward to a meeting, at your convenience, to receive your comments and clarify any points which might require explanation.

Very truly yours,

UNIVERSAL OIL PRODUCTS COMPANY

E. J. Swain

E. J. Swain

EJS:mf

J-7, "Processing & Economic Data for a Proposed Puerto Rico Refinery", October 1961

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PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

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Pictures of the following process units:

Crude and Vacuum Units
Polymerization Unit
Merox Unit
Fluid Catalytic Cracking
Unifining - Platforming Units
Hydeal Unit
H F Alkylation Unit
Udex Unit

PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

SECTION I

Introduction

As requested by Omega Management Incorporated, Universal Oil Products Company has conducted a survey to present the economic evaluation of a proposed refinery to be located in Puerto Rico. The survey was carried out under the terms and conditions of a contract dated September 12, 1961.

The primary purpose of this study is to act as an aid in the investigation of the general economics of a proposed 100,000 barrels per day (BPD) refinery processing a typical Venezuelan crude to produce normal petroleum fuels as well as the maximum feasible quantity of petrochemical raw materials and intermediates.

There are many process schemes that are available in the petroleum refining industry, which are mainly dependent upon the product markets the organization wish to enter. The two cases presented in this report may be considered typical and are as follows:

Case I - Producing normal petroleum fuels that will meet current and future markets as far as quality is concerned.

Case II - Producing normal petroleum fuels that will meet current and future markets as far as quality is concerned plus the production of some of the normal petrochemicals that are commonly derived from petroleum sources.

Included in this report are tables showing the operating cost and expenses, profitabilities, and yield estimates of the various process units utilized in the two cases. Also, a general description of the processes with their flow diagrams are present.

To also aid in determining a process scheme when producing petrochemical intermediates, a section is included describing possible processes that will utilize these intermediates.

The attached process and economic study is largely based on information developed and processed by Universal in regards to Puerto Rico. However, while the study has been prepared

by us in accordance with established engineering practice and is useful in evaluating the proposed refinery and operations, it does not constitute any warranty, representation or guarantee with respect thereto. It is understood that Universal Oil Products Company's name shall not be used in connection with any prospectus or securities registration statement to be filed by your company with any governmental agency.

PROCESS AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

SECTION 2

Basic Considerations

In performing the study certain assumptions were made and are listed in this section under various categories.

Crude Oil Supply and Price

In reviewing the crude oils that are available from Venezuela, several crudes were found to be typical and in sufficient production quantity that could supply the needs of the proposed refinery. For this study, a Venezuelan crude known as Tia Juana Medium crude was used. This crude is believed to be available for long term contracts. A laid-in price at the refinery for this crude was taken at $2.35/Bbl.

Product Market and Prices

The quantity of petroleum products produced from a 100,000 BSD refinery located in Puerto Rico were assumed to be, to a great extent, exported out of the country to the east coast markets of the United States. Current output of the two refineries presently in Puerto Rico far outdistances current and future demands of petroleum fuel for local market consumption. A relatively high percentage of the current refinery outputs are exported to the east coast markets. The assumption was also made with petrochemical raw materials and intermediates although joint ventures or future petrochemical expansion could limit the export of petrochemicals so derived.

Therefore, all petroleum fuel products and petrochemical material were assumed to have sufficient export and local markets to absorb all production quantities. It is suggested that an organization contemplating entering in the refining or petrochemical industry should make a close examination to determine their market position as to the type of products and quantities they wish to handle under long term manufacturing contracts.

Product prices used in the study are believed to be those generally applicable to those received at the refinery gates in the Puerto Rico area. They are a combination of local market prices and export market prices.

Product Price	$/Bbl.	¢/Gal.
Premium Gasoline	4.979	11.86
Regular Gasoline	4.628	11.02
No. 1 Fuel Oil	3.896	9.28
No. 2 Fuel Oil	3.430	8.17
No. 6 Fuel Oil	2.151	5.12
Pitch	1.800	4.29
L.P.G. (C_3)	2.964	7.06
Mixed C_3's	2.964	7.06
Mixed C_4's	2.964	7.06
Benzene	12.600	30.00
Toluene	7.560	18.00
C_8 Aromatics	6.300	15.00
Raffinate	4.041	9.62
Naphthalene, ¢/#	--	(5.0)

Operating Costs

In constructing the operating costs for a Puerto Rican refinery various costs such as labor, utilities, fringe benefits, operating personnel requirements as effected by local labor efficiency, and other associated costs were taken into general consideration based on knowledge from current similar operations present in Puerto Rico.

Estimated Process and Offsites Investment

The estimated capital investment for process and offsites facilities of the proposed schemes are based on curve estimates of current day costs of similar equipment erected at a U.S. Gulf Coast location. These cost estimates are subject to precise design definition, however, they are sufficiently accurate for planning purposes. There may be some question arise as to the differences that construction costs would be lower in Puerto Rico than the United States Gulf Coast. It is believed that all major items of equipment will be shipped in from the U.S. which will increase material costs somewhat over Gulf Coast prices. Labor prices are lower in Puerto Rico but considering the available pool of skilled labor in Puerto Rico to construct a 100,000 BSD refinery is quite small. A construction firm would need to import continentals to supply the skill job classifications. This labor cost as well as somewhat higher material costs should just about equalize capital investment in Puerto Rico to that at the U.S. Gulf Coast location.

Yield Estimates

The exactness of the yield estimates shown throughout Cases I and II are adequate for the purposes of this report, but will require confirmation for precise process designs. Depending on the final settlement of the type of crude to process and type of products to be produced will determine the process scheme as well as more precise yield.

In order to provide the highest reasonable degree of accuracy in the estimates made through this report, the respective product distribution and erected cost are based upon processes licensed by Universal Oil Products Company. Specific processes of the same general type will experience somewhat different product distribution and erected cost. Because of our greater familiarity with the specific capability and cost factors of these processes as compared with competing processes, the estimates shown in this report are based on processes as follows:

Specific UOP Process Used as Basis for Evaluation

UOP Fluid Catalytic Cracking Unit (F.C.C.)
UOP Solid Phosphoric Acid Polymerization Unit
UOP HF Alkylation Unit
UOP Platforming Unit
Unifiner
Udex
UOP Hydeal
UOP Merox

Other non-licensed processes and offsite facilities are the type that Universal has had many years of commercial experience in the design and economic evaluation.

Refinery Site

It should be mentioned that no estimates were made pertinent to the exact location of the refinery other than it is to be located in Puerto Rico. Although this would be an important consideration in the total economic picture, it was considered beyond the scope of this report.

However, some general statements can be made in regard to a refinery location.

1. Location should be near a source of skilled and semi-skilled labor makret - major cities such as San Juan, Ponce, Mayaguez, etc.

2. Fairly flat land located along the water edge, approximately 350-450 acres of land may be needed for this size refinery.

3. Close deep water or natural protect bay for tanker loading and unloading. The northern side of the island needs well sheltered bays for the winds and ocean movement are a problem.

(Items 2 and 3 can affect offsites capital investment a sufficient amount.)

4. Located near a source of dependable power.

On Stream Time

345 stream days per year have been used giving a 95% on stream efficiency. For example, 100,000 barrels per stream day (BSD) of crude charge to the crude unit is 95,000 barrels per calendar day (BCD). The other 15 days left in the year are for process maintenance.

Utilities

Electricity - Assume purchase of power from Puerto Rico Water Resources Authority.

Refinery Fuel - Refinery fuel gases produced from the various processing units with the supplement requirements made up by using visbreaker pitch. Gaseous fuel deficiency would be made up by the pitch, which would be used preferably in the atmospheric and vacuum distillation and visbreaking unit.

Water Supply - A potable water supply for refinery sanitary facilities and steam boiler make-up is assumed to be obtained from fresh water wells. Process cooling water will be sea water.

Steam Generating Facilities - Sufficient refinery steam generating facilities have been provided even in the cases where a process having waste heat-steam generation facilities may be upset.

Inventories - Crude and Products

Since crude and product inventories tie up a large dollar value in a refinery of 100,000 BSD capacity, a strict control and review should set policy on this matter. It is assumed that crude inventory is twenty days for this size refinery. A leasing of super tankers to handle crude delivery should be investigated. A round trip for crude delivery by super tanker is considered about 5-8 days between Venezula and Puerto Rico.

The majority of the products produced are considered for exporting to the east coast of the United States. A reasonable inventory was taken into account for the products considering time necessary for a round trip and quantity of material available for shipment by T-2 tankers.

A thorough investigation of the pitch and LPG local markets will aid in determining the economics of supplementary refinery fuel gas with either pitch or LPG. Large LPG inventories can be costly from the storage standpoint.

Acquirement of Total Capital Investment

The total capital investment was assumed to be raised by the following means as stipulated by Omega Management Incorporated.

20% of capital investment will be equity capital
80% of capital investment will be convertible sinking funds debentures, 6% interest rate, 20 year term.

In determining the economics of the two cases, it was assumed that the yearly sinking fund payment is 1/20 of the total debentures. Yearly payment is made at the end of the year and from income after taxes. The 6% interest rate on the sinking fund debentures is one the year beginning unpaid balance of debentures.

Equity capital is in the form of common stock.

Income and Property Tax

During the first ten years of the proposed cases no corporate income or property tax is due. The rates used after that are based on the current rates as developed by the Department of the Treasury, Commonwealth of Puerto Rico and listed in "What You Should Know About Taxes in Puerto Rico", 1961 edition.

Depreciation Rates and Items

Depreciation rates and items used in the economics of the two cases are considered normal for a typical refinery. However, there are always extremes from the average for various reasons and is determined by company policy, within government regulations.

Process and offsites facilities and starting capital are considered the depreciable items. Depreciation rate is as follows:

1. Process capital - straight line on 15 years life - 10% salvage value
2. Offsites capital - straight line on 20 years life - 10% salvage value
3. Startup capital - straight line on 10 years life

PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

SECTION 3

Summary

On the basis of the premises outlined under the introduction, Section 1, and basic considerations, Section 2, it is estimated that a 100,000 BSD refinery can be built in Puerto Rico at a cost of $82.6 to $94.3 million, including working capital and startup expenses depending upon the processing scheme selected.

Capital not included in the above investment costs are those for the acquisition of land, and for the necessary dock facilities. These two cost items could raise the above capital investments several million dollars. However, until a more definite plan is formulated, these items are beyond the scope of this report.

Tabulated in Table I and II is a summary of the investment, payout and net operating profit for the respective cases under consideration. Based upon the net equity earnings generated over a 20 year period as shown in the tables, it would seem that either scheme would warrant serious consideration. However, the author believes at this time that economics presented are slightly over optimistic for several reasons which are as follows:

1. Total capital investment shown is understated for reasons previously mentioned.

2. Product yields shown from both cases are assumed to be consumed either on the local markets or export market. Again as mentioned in Section 2 of this report, an organization contemplating entering the refining or petrochemical industry should make a close examination to determine their market position as to the type of products and quantities they wish to handle under long term manufacturing contracts.

The two schemes presented indicated a fairly good return of common equity. Moreover, if there is more than just a good return on investment in consideration such as a possible stimulus to the Puerto Rico economy, this is beyond the scope of the report. Perhaps a little philosophy at this point may aid in the investigation of the general economics of a proposed

100,000 BPD refinery. If it is desired that the product output of this refinery be more petrochemical raw materials and intermediates rather than petroleum fuels, the following alternatives may be taken:

Process modification to Case II scheme.

1. The addition of a low pressure coker that will use virgin vacuum bottoms as feedstock to produce petroleum coke, and lighter distillate materials that could be consumed as feedstocks in the processes shown in Case II. This would lower the yield of pitch and No. 6 fuel oil otherwise produced as well as increasing the amounts of aromatic and olefin materials.

2. The addition of a UOP Lomax Process (Hydrocracking) that could convert light and heavy distillates (including vacuum gas oil) into naphthas that could increase the output of the aromatic chemicals. This would lower the output of middle distillates and perhaps heavy distillates depending on the process schemes.

3. The addition of ethylene cracking processing could increase the olefin compounds that are perhaps desired. The feedstocks that may be used for ethylene cracking could be many of the normal products available from Case II.

Feed stock modification to Case II scheme.

1. Rather than running the total 100,000 BPD in the form of crude oil, there is the possibility of replacing a portion of the crude with purchased naphtha. This material is available from Venezuela in quantities that could deem a serious investigation into increasing the output of aromatic chemicals.

In conclusion, this report is believed to act as an aid in the investigation of the general economics of a proposed refinery to be located in Puerto Rico. Moreover, it points out areas for further investigation depending upon the corporation's policies of entering into petroleum or petrochemical manufacture.

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PHOSPHORIC ACID PLANT
CASE I
ESTIMATED NET OPERATING INCOME

Product Value	Charge Value	Gross Profit	Operating Expenses	Net Profit	Sinking Fund Debent.	Debent Interest, 6%	Income Before Deprec.	Deprec.	Balance Before Taxes	Income Taxes	Income After Taxes	Earnings Criteria Net	Earnings Criteria Gross
$[illegible]	$[illegible]	$[illegible]	$[illegible]	$[illegible]	$[illegible]	$[illegible]	$[illegible]	$[illegible]	$[illegible]	---	$[illegible]	$[illegible]	$[illegible]
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$3,977.5	$22,341.9	$3,564.1	$18,795.8	---	$[illegible]	$[illegible]	$[illegible]
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$3,776.6	$22,572.3	$3,564.1	$18,944.7	---	$18,795.7	$15,630.1	$19,560.2
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$3,579.7	$22,781.7	$3,564.1	$19,193.6	---	$19,193.6	$15,929.0	$19,959.1
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$3,380.8	$22,980.6	$3,564.1	$19,392.5	---	$19,392.5	$16,077.9	$20,058.0
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$3,182.0	$23,177.4	$3,564.1	$19,591.3	---	$19,591.3	$16,276.7	$20,256.8
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$2,983.1	$23,376.3	$3,564.1	$19,790.2	---	$19,790.2	$16,475.6	$20,455.7
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$2,784.2	$23,577.2	$3,564.1	$19,989.1	---	$19,989.1	$16,674.5	$20,654.6
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$2,585.3	$23,776.1	$3,564.1	$20,188.0	---	$20,188.0	$16,873.4	$20,853.5
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$2,386.5	$23,974.9	$3,564.1	$20,386.8	---	$20,386.8	$17,072.2	$21,052.3
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$2,187.6	$24,173.8	$3,564.1	$20,585.7	---	$20,585.7	$17,271.1	$21,251.2
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$1,988.7	$24,372.7	$3,510.0	$20,862.7	$7,646.6	$13,196.1	$9,881.5	$16,511.5
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$1,789.8	$24,571.6	$3,510.0	$21,061.6	$7,719.7	$13,341.9	$10,027.3	$16,657.3
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$1,591.0	$24,770.4	$3,510.0	$21,260.4	$7,792.7	$13,467.7	$10,153.1	$16,783.1
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$1,392.1	$24,969.3	$3,510.0	$21,459.3	$7,865.8	$13,593.5	$10,278.9	$16,908.9
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$1,193.2	$25,168.2	$3,510.0	$21,658.2	$7,938.9	$13,719.3	$10,404.7	$17,034.7
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$994.3	$25,367.1	$1,374.8	$23,992.3	$8,804.1	$15,188.2	$11,873.6	$18,503.6
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$795.5	$25,565.9	$1,374.8	$24,191.1	$8,877.1	$15,313.0	$11,999.4	$18,629.4
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$596.6	$25,764.8	$1,374.8	$24,390.0	$8,950.2	$15,439.8	$12,125.0	$18,755.0
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,314.6	$397.7	$25,963.7	$1,374.8	$24,588.9	$9,021.3	$15,565.6	$12,251.0	$18,881.0
[illegible]	$1,675.0	$39,904.0	$13,442.6	$26,361.4	$3,313.7	$198.8	$26,162.6	$1,374.8	$24,787.8	$9,086.4	$15,701.4	$12,387.7	$19,762.5

Total capital investment - $42,961,900
2 $ Equity Capital - $16,672,900
6.5 Convertible debenture Fund - $66,291,100
Debentures, 6% interest, 20 years
Yearly Sinking Fund, 1/20 of $66,291,100 - $3,314,600 paid at the end of each year
out of income after taxes
Debenture interest, 6% on the unpaid debentures
Earnings on equity: net - income after payment of the yearly sinking fund
gross - income after payment of the yearly sinking fund plus de
depreciation
Depreciable item: Process and offsites facilities and startup capital
Depreciation rate: Process Capital - straight line on 15 years life - 10% salvage value
Offsites capital - straight line on 20 years life - 10% salvage value
Depreciable Capital - straight line on 10 years life
Income tax: No income tax due for 1st ten years. Thereafter, tax rate is 36.75% of taxable net income less $13,100
All numbers in thousands

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PETROLEUM REFINERY
CASE II
ESTIMATED NET OPERATING INCOME

Year	Product Value	Charge Value	Gross Profit	Operating Expenses	Net Profit	Sinking Fund Debent.	Debent. Interest, 6%	Income Before Deprec.	Deprec.	Balance Before Taxes	Income Taxes	Income After Taxes	Earnings On Equity Net	Gross
1	$121,791.2	$81,075.0	$40,716.2	$14,945.1	$25,771.1	$3,772.2	$4,526.7	$21,244.4	$4,172.0	$17,072.4	---	$17,072.4	$13,300.2	$17,472.2
2	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	4,300.3	21,470.6	4,172.0	17,298.6	---	17,298.6	13,526.4	17,698.4
3	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	4,074.0	21,697.1	4,172.0	17,525.1	---	17,525.1	13,752.9	17,925.0
4	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	3,847.7	21,923.4	4,172.0	17,751.4	---	17,751.4	13,979.2	18,151.2
5	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	3,621.3	22,149.8	4,172.0	17,977.8	---	17,977.8	14,205.6	18,377.6
6	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	3,395.0	22,376.1	4,172.0	18,204.1	---	18,204.1	14,431.9	18,603.9
7	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	3,168.7	22,602.4	4,172.0	18,430.4	---	18,430.4	14,658.2	18,830.2
8	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	2,942.3	22,828.8	4,172.0	18,656.8	---	18,656.8	14,884.6	19,056.6
9	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	2,716.0	23,055.1	4,172.0	18,883.1	---	18,883.1	15,110.9	19,283.0
10	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	2,489.7	23,281.4	4,172.0	19,109.4	---	19,109.4	15,337.2	19,509.2
11	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	2,263.1	23,507.8	4,104.5	19,403.3	$7,117.6	12,285.7	8,513.5	16,277.7
12	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	2,037.0	23,734.1	4,104.5	19,629.6	7,200.0	12,429.6	8,639.4	16,534.1
13	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	1,810.7	23,960.4	4,104.5	19,855.9	7,283.9	12,572.0	8,765.8	16,790.3
14	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	1,584.3	24,186.8	4,104.5	20,082.3	7,369.1	12,713.2	8,892.0	17,047.5
15	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	1,358.0	24,413.1	4,104.5	20,308.6	7,454.3	12,854.3	9,018.1	17,300.6
16	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	1,131.7	24,639.4	1,465.7	23,173.7	8,506.2	14,667.5	10,831.3	19,136.0
17	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	905.4	24,865.7	1,465.7	23,400.0	8,589.4	14,810.6	10,964.5	19,277.2
18	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	679.0	25,092.1	1,465.7	23,626.4	8,673.6	14,952.8	11,098.6	19,418.3
19	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.2	452.7	25,318.4	1,465.7	23,852.8	8,752.8	15,099.9	11,327.7	19,565.6
20	121,791.2	81,075.0	40,716.2	14,945.1	25,771.1	3,772.6	226.4	25,544.7	1,465.7	24,079.0	8,835.9	15,243.1	11,470.5	19,716.2

Notes:
(a) Total capital investment - $94,305,500
20% Equity Capital - $18,861,100
80% Convertible Sinking Fund - $75,444,400
Debentures, 6% interest, 20 years
(b) Yearly Sinking Fund, 1/20 of $75,444,400 = $3,772,200 paid at the end of each year out of income after taxes
(c) Debenture interest, 6% on the unpaid debentures
(d) Earnings on equity: Net income after payment of the yearly sinking fund
Gross income after payment of the yearly sinking fund plus depreciation
(e) Depreciable items: Process and offsites facilities and startup capital
(f) Depreciation rate: Process Capital-straight line on 15 years life - 10% salvage value
Offsite capital-straight line on 20 years life - 10% salvage value
Depreciable capital-straight line on 10 years life
(g) Income Tax: No income tax due for 1st ten years. Thereafter, tax rate is 36.75% of taxable net income less $13,100
(h) All numbers in thousands

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

Section 4

Operating Costs and Capital Investments

In this section are presented in detail the information covering the operating costs and capital investments for cases I and II. Constructing the following tables of operating costs and capital investments certain assumptions were used as outlined in Section 2, Basic Considerations, of this report.

PROCESSING AND ECONOMIC DATA
FOR A [illegible] MISC REFINERY
PART III
CASE I
ESTIMATED DAILY OPERATING COST

		$/SD
1.	Refinery Labor	
	Including Maintenance, Safety, Warehouse and Utilities	6,590
2.	Tetraethyl Lead	
	Cost @ 0.25¢/cc T.E.L.	3,613
3.	Maintenance - Offsites and Process	7,862
4.	Laboratory and Misc. Supplies	240
5.	Catalyst	
	(a) F.C.C. catalyst @ 0.3 lb/bbl. @ 18¢/lb.	1,280
	(b) Platforming catalyst @ 40 bbl./lb. @ $3.15 net replacement cost	1,909
	(c) Unifining catalyst	
	1. Naphtha Unifiner @ 200 bbl./lb. @ $1.60/lb.	177
	2. Distillate Unifiner @ 200 bbl./lb. @ $1.05/lb.	113
	(d) H.F. acid catalyst @ 0.3 lb./bbl. of 2# alkylate @ 26¢/lb.	220
	(e) Polymerization catalyst @ 100 gal. of 2# polymer/lb. @ 30¢/lb.	137
	(f) Merox catalyst	
	F.C.C. Gasoline Merox	---
	C_3/C_4 Merox	---
	Total Catalyst	3,936
6.	Chemicals and Inhibitor	
	(a) Gasoline additives	
	1. Sweetening agent, 3 lbs/1,000 bbls @ $1.00/#	115
	2. Corrosion inhibitor, 6 lbs/1,000 bbls. @ 39¢/#	89
	3. Metal inhibitor, 1 lb/1,000 bbls. @ $1.00/#	38

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	$/SD
(b) Corrosion inhibitor, ammonia, lime, etc., @ 30¢/lb.	85
(c) Water Treating, $1.50 per day/1,000 gpm circulated	130
Total Chemicals	457

7. Royalties (Running Basis)

(a) F.C.C. @ 4¢/bbl. charge	948
(b) Platforming @ 5.5¢/bbl. charge	1,217
(c) Unifining	
Naphtha Unifining - Waiver	---
Distillate Unifining @ 1.5¢/bbl. charge	324
(d) HF Alkylation @ 19¢/bbl. 2# Alkylate	536
(e) Polymerization @ 14.7¢/bbl. 2# polymer	160
(f) Merox	
F.C.C. Gasoline @ 0.5¢/bbl. charge	60
C_3/C_4 @ 0.5¢/bbl.	46
Total Royalties	3,291

8. Insurance

Estimated @ 2.0% of Process, Offsites and Inventories	4,724

9. Utilities

Electricity @ 1.0¢/KWH	3,764
Fuel @ 35.0¢/10^6 Btu*	2,151
Cooling Water @ 0.9¢/1,000 gals. once-through	1,121
Steam @ 55.0¢/1,000 #	1,315
Total Utilities	8,351
Total Direct Operating Cost	38,964

*Pitch used to supplement refinery gas

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED HYDRO T CO REFINERY
TABLE IV
CASE II
ESTIMATED DIRECT OPERATING COST

		$/SD
1.	Refinery Labor	
	Including Maintenance, Safety, Warehouse and Utilities	6,868
2.	Tetraethyl Lead	
	Cost @ 0.25¢/cc T.E.L.	2,751
3.	Maintenance - Offsites & Process	9,206
4.	Laboratory & Misc. Supplies	275
5.	Catalyst	
	(a) F.C.C. catalyst @ 0.3 lb/lb.@ 18¢/lb.	1,280
	(b) Platforming catalyst	
	1. B-T-X Platformer - 50 bbl./lb	680
	2. Hwg. Nap. Platformer - 55 bbl/lb @ $3.45/lb. net replacement cost	902
	(c) Unifining catalyst	
	1. Naphtha Unifiner @ 200 bbl/lb. @ $1.60/lb.	194
	2. Distillate Unifiner @ 200 bbl./lb. @ $1.05/lb.	104
	(d) Hydeal catalyst @ 5 bbl./lb. @ $1.00/lb.	414
	(e) Merox catalyst	
	F.C.C. Gasoline Merox	---
	C_3/C_4 Merox	---
	Total Catalyst	3,574
6.	Chemicals and Inhibitor	
	(a) Gasoline additives	
	1. Sweetening agent 3 lbs./1,000 bbls @ $1.00/#	79
	2. Corrosion inhibitor, 6 lbs./1,000 bbls. @ 39¢/#	61
	3. Metal inhibitor 1 lb./1,000 bbls @ $1.00/#	26

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Case II - Estimated Direct Operating Cost (Cont'd.)

		$/SD
(b)	Corrosion inhibitor, ammonia, lime amine, etc. @ 30¢/lb.	85
(c)	Water treating, $1.50 per day/1,000 gpm circulated	145
(d)	Glycol @ 0.1 lb. glycol/bbl. of charge @ 17¢/lb.	136
(e)	Clay @ 0.5 lb. clay/bbl. of aromatics @ $30/ton	25
	Total Chemicals	557
7.	Royalties (Running Basis)	
(a)	F.C.C. @ 4¢/bbl. charge	948
(b)	Platforming @ 5.5¢/bbl. charge	1,223
(c)	Unifining	
	Naphtha Unifining - Waiver	---
	Distillate Unifining @ 1.5¢/bbl. charge	297
(d)	Hydeal @ 5% of naphthalene sale value and 0.5¢/gal. benzene	857
(e)	Udex @ $250,000 amortized over 10 yrs.	73
(f)	Merox	
	F.C.C. Gasoline @ 0.5¢/bbl. charge	62
	C_3/C_4 @ 0.5¢/bbl.	40
	Total Royalties	3,500
8.	Insurance	
	Estimated @ 2.0% of process, offsites and inventories	5,378
9.	Utilities	
	Electricity @ 1.0 ¢/KWH	4,022
	Fuel @ 35.0¢/10^6 Btu*	3,330
	Cooling water @ 0.9/1,000 gals. once-through	1,251
	Steam @ 55.0¢/1,000#	2,607
	Total Utilities	11,210
	Total Direct Operating Cost	43,319

*Pitch used to supplement refinery gas

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] MEXICO REFINERY
TABLE V
CASE I
ESTIMATED UTILITIES

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Electricity	KW
Crude, Vacuum and Stabilizer Units	1,776
Naphtha Unifining Unit	296
Distillate Unifining Unit	2,040
Platforming Unit	5,920
F.C.C. and Gas Concentration Units	2,304
Visbreaking Unit	111
HF Alkylation Unit	285
Polymerization Unit	148
F.C.C. Gasoline Merox Unit	93
C_3/C_4 Merox Unit	95
Sub-Total	13,068
Miscellaneous, 20%	2,614
Total	15,682

Fuel	
Crude, Vacuum and Stabilizer Units	-444
Naphtha Unifining Unit	-94
Distillate Unifining Unit	-102
Platforming Unit	-296
F.C.C. and Gas Concentration Units	-36
Visbreaking Unit	-78
HF Alkylation Unit	-48
Polymerization Unit	-
F.C.C. Gasoline Merox Unit	-
C_3/C_4 Merox Unit	-
Sub-Total	-1,098
Boiler House	-142
Total	-1,240

Btu/day required	$29,760 \times 10^6$ Btu
Btu/day from fuel gas	$22,239 \times 10^6$ Btu
Btu/day needed to be purchased	$7,521 \times 10^6$ Btu

Therefore, 1,195 B/D Pitch used to supplement refinery fuel gas.

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CASE I
ESTIMATED UTILITIES
Page 2

Cooling Water	gpm
Crude, Vacuum and Stabilizer Units	31,100
Naphtha Unifining Unit	3,100
Distillate Unifining Unit	8,800
Platforming Unit	11,500
F.C.C. and Gas Concentration Units	23,300
Visbreaking Unit	3,300
HF Alkylation Unit	2,500
Polymerization Unit	2,900
F.C.C. Gasoline Merox Unit	-
C_3/C_4 Merox Unit	-
Total	86,500

Steam	1,000 #/hr.
Crude Vacuum and Stabilizer Units	-38.9
Naphtha Unifining Unit	-8.7
Distillate Unifining Unit	-10.2
Platforming Unit	-
F.C.C. and Gas Concentration Units	-89.0
Visbreaking Unit	-3.8
HF Alkylation Unit	-10.2
Polymerization Unit	-21.8
F.C.C. Gasoline Merox Unit	-4.0
C_3/C_4 Merox Unit	-1.2
Sub-Total	-187.8
Miscellaneous, 10%	-18.8
Total	-206.6
Platforming Steam Generator	+56.8
F.C.C. Steam Generator	+50.2
Boiler House	+99.6
Total	+206.6

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PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

TABLE VI
CASE II
ESTIMATED UTILITIES

Electricity

	KW
Crude, Vacuum and Stabilizer Units	1,776
Light Naphtha Unifining Unit	154
Heavy Naphtha Unifining Unit	219
Distillate Unifining Unit	1,870
B-T-X Platforming Unit	1,683
Heavy Naphtha Platforming Unit	1,836
Udex Unit	506
Naphthalene Hydeal Unit	2,705
F.C.C. and Gas Concentration Units	2,928
Visbreaking Unit	111
F.C.C. Gasoline Merox Unit	95
C_3/C_4 Merox Unit	84
Sub-Total	13,957
Miscellaneous, 20%	2,793
Total	16,750

Fuel

	10^6 Btu/Hr.
Crude, Vacuum and Stabilizer Units	-444
Light Naphtha Unifining Unit	-46
Heavy Naphtha Unifining Unit	-68
Distillate Unifining Unit	-94
B-T-X Platforming Unit	-105
Heavy Naphtha Platforming Unit	-358
Udex Unit	-3
Naphthalene Hydeal Unit	-100
F.C.C. and Gas Concentration Units	-46
Visbreaking Unit	-78
F.C.C. Gasoline Merox Unit	-
C_3/C_4 Merox Unit	-
Sub-Total	-1,342
Boiler House	-281
Total	-1,623

Btu/day required	$38,952 \times 10^6$ Btu
Btu/day from fuel gas	$27,311 \times 10^6$ Btu
Btu/day needed to be purchased	$11,641 \times 10^6$ Btu

Therefore 1,850 B/D Pitch used to supplement refinery fuel gas

CASE II
ESTIMATED UTILITIES
PAGE 2

Cooling Water

	gpm
Crude, Vacuum and Stabilizer	31,100
Light Naphtha Unifining Unit	1,600
Heavy Naphtha Unifining Unit	2,300
Distillate Unifining Unit	8,000
B-T-X Platforming Unit	3,400
Heavy Naphtha Platforming Unit	6,900
Udex Unit	5,400
Naphthalene Hydeal Unit	4,900
F.C.C. and Gas Concentration Units	29,600
Visbreaking Unit	3,300
F.C.C. Gasoline Merox Unit	-
C_3/C_4 Merox Unit	-
Total	96,500

Steam

	1,000 #/Hr.
Crude Vacuum and Stabilizer	-38.9
Light Naphtha Unifining Unit	-4.4
Heavy Naphtha Unifining Unit	-6.5
Distillate Unifining Unit	-9.4
B-T-X Platforming Unit	-10.4
Heavy Naphtha Platforming Unit	-
Udex Unit	-85.7
Naphthalene Hydeal Unit	-
F.C.C. and Gas Concentration Units	-113.1
Visbreaking Unit	-3.8
F.C.C. Gasoline Merox Unit	-4.1
C_3/C_4 Merox Unit	-1.0
Sub-Total	-277.3
Miscellaneous, 10%	-27.7
Total	-305.0
B-T-X Platforming Steam Generator	+11.7
Heavy Nap. Platforming Steam Generator	+32.0
F.C.C. Steam Generator	+63.8
Boiler House	+197.5
Total	+305.0

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ESTIMATED MANPOWER REQUIREMENTS

Management - Case I, Case II

	Days
Manager	1
Assistant Manager, Process Superintendent, Chief Engineer, Mech. Superintendent	1
Personnel Manager	1
Chief Chemist	1
Comptroller	1
With Above: Secretaries	6
Total Management	12

Office - Case I, Case II

	Days
General Accounting Manager, Refinery Accounting Manager	1
Oil Accounting Manager	1
Material Accounting Manager	1
Accounting Clerks	2
Yield Accountant	1
Billing Clerk	1
Tanker Agent	1
Payroll Clerk	1
Shipping Clerk, Purchasing Agent	3
Office Service:	
Receptionist/Telephone Operator	1
Stenographers & Typists	8
Total Office	23

Laboratory - Case I, Case II

	Days
Chemists	6
Knock Tester	1
Podbielniak Operator	1
Technicians	11
Washers	3
Samplers	4
Total	26

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ESTIMATED PERSONNEL REQUIREMENTS
Page 2

Safety - Case I, Case II

	Days
Chief Safety Engineer	1
Asst. Chief Safety Engineer	1
Fireman & Safety Personnel	6
Total	8

Technical & Economics - Case I, Case II

	Days
Technical Superintendent)	
Economics Superintendent)	1
Engineers	6
Secretary	1
Total	8

Warehouse - Case I, Case II

	Days
Chief Storekeeper	1
Assistant	2
Clerks	2
Helpers	6
Total	11

First Aid - Case I, Case II

	Days
Doctor	1
Medical Assistant	1
Nurses	3
Total	5

General Workers & Security - Case I, Case II

	Days
Chief Watchman	1
Shift Watchman	15
Porters	4
Yardmen	4
Total	24

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ESTIMATED PERSONNEL REQUIREMENTS
Page 3

Maintenance - Case I, Case II

	Days
Chief Mechanical Engineer	1
Chief Civil Engineer	1
Draftsmen	3
Mechanical Foreman	6
Pipofitters	3
Pipefitters Helpers	9
Welders	2
Welders Helpers	2
Machinists	4
Machinists Helpers	8
Pump Mechanics	3
Pump Mechanics Helpers	3
Boiler Makers	4
Boiler Makers Helpers	4
Chief Electrician	1
Electricians	3
Electrician Helpers	3
Instrument Men	6
Carpenters	2
Carpenters helpers	2
Painters	2
Painters Helpers	2
Insulator	4
Bricklayers	1
Bricklayers Helpers	1
Masons	2
Masons Helpers	2
Truck Drivers	6
Garage Mechanics, etc.	6
Labor Foremen	2
Laborers	40
Total	138

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ESTIMATED PERSONNEL REQUIREMENTS
Page 4

Oil Movement - Case I, Case II

	Days
Superintendent	1
Assistant Superintendent	1
Cargo Inspector	1
Pumpers	9
Pumper Helpers	9
Gaugers	9
Dock Clerks	3
Pumpers	3
Pipe Fitters	4
Pipe Fitters Helpers	10
Truck Loaders	4
Truck Loaders Helpers	4
Oil Separator Operator	4
Total	62

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ESTIMATED PERSONNEL REQUIREMENTS
Page 5

Operations - Case I	Per Shift
Shift Foreman	1
Crude, Vacuum & Stabilizer	
Senior Operator	1
Board Man	1
Helper	2
Visbreaking Unit	
Senior Operator	1
Board Man	1
Helper	1
Naphtha Unifiner - Platformer	
Senior Operator	1
Board Man	1
Helper	2
Distillate Unifiner	
Senior Operator	1
Helper	1
F.C.C. & Gas Conc.	
Senior Operator	1
Board Man	1
Helper	2
Alkylation Unit	
Senior Operator	1
Board Man	1
Polymerization Unit	
Board Man	1
Helper	1

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ESTIMATED PERSONNEL REQUIREMENTS
Page 6

	Per Shift
Boiler House	
Senior Operator	1
Water Treating & Pumping	2
Treaters & Splitter	
Board Man	1
Helper	1
Total	27

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ESTIMATED PERSONNEL REQUIREMENTS
Page 7

Operations - Case II	Per Shift
Shift Foreman	1
Crude, Vacuum & Stabilizer	
Senior Operator	1
Board Man	1
Helper	2
Visbreaking Unit	
Senior Operator	1
Board Man	1
Helper	1
Naphtha Unifiner - B-T-X Platformer-Udex	
Senior Operator	1
Board Man	2
Helper	3
Naphtha Unifiner - Platformer - Hydeal	
Senior Operator	1
Board Man	2
Helper	3
Distillate Unifiner	
Senior Operator	1
Helper	1
F.C.C. & Gas Con.	
Senior Operator	1
Board Man	1
Helper	2
Boiler House	
Senior Operator	1
Water Treating & Pumping	2
Treaters & Splitter	
Board Man	1
Helper	1
Total	31

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] PLANT
ESTIMATED PERSONNEL REQUIREMENTS & COSTS

	Case I		Case II	
	No.	$/SD	No.	$/SD
Management	12	642	12	642
Office	23	262	23	262
Laboratory	26	346	26	346
Safety	8	100	8	100
Technical & Economics	8	176	8	176
Warehouse	11	182	11	182
First Aid	5	63	5	63
General Workers & Security	24	300	24	300
Maintenance	138	1,800	138	1,800
Oil Movement	62	583	62	583
Operations	114	2,136	131	2,414
Total	431	6,590	448	6,868

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY
TABLE IX
CASE I
ESTIMATED PROCESS INVESTMENT

PROCESS UNITS	MATERIAL & LABOR COSTS
1. Crude Unit	
Including desalter, full corrosion protection & stabilizer	$8,630,000
2. Vacuum Unit	2,580,000
3. Naphtha Unifining Unit	1,030,000
4. Distillate Unifining Unit	3,250,000
5. Platforming Unit	2,140,000
6. F.C.C. Unit	5,760,000
7. Gas Concentration Unit	1,440,000
8. Visbreaking Unit	2,880,000
9. H Falkylation Unit	1,210,000
10. Polymerization Unit	550,000
11. F.C.C. Gasoline Merox Unit	320,000
12. C_3/C_4 Merox Unit	650,000
Process Units - Total M & L	$30,440,000
Design, engineering, contractor's expense and overhead, 18%	5,480,000
Total	$35,920,000

PROCESSING AND ECONOMIC DATA
FOR A [illegible] TO HEAVY REFINERY
CASE II
ESTIMATED PROCESS INVESTMENT

PROCESS UNITS	MATERIAL & LABOR COSTS
1. Crude Unit	
Including desalter, full corrosion protection & stabilizer	$8,630,000
2. Vacuum Unit	2,580,000
3. Light Naphtha Unifining Unit	1,040,000
4. Heavy Naphtha Unifining Unit	1,240,000
5. Distillate Unifining Unit	3,110,000
6. B-T-X Platforming Unit	2,210,000
7. Heavy Naphtha Platforming Unit	1,990,000
8. Udex Unit	1,970,000
9. Naphthalene Hydeal Unit	2,740,000
10. F.C.C. Unit	6,510,000
11. Gas Concentration Unit	1,440,000
12. Visbreaking Unit	2,880,000
13. F.C.C. Gasoline Merox Unit	320,000
14. C_3/C_4 Merox Unit	610,000
Process Units - Total M & L	$37,270,000
Design, engineering, contractor's expense and overhead, 18%	6,710,000
Total	$43,980,000

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] PUERTO RICO REFINERY
TABLE A1
CASE I
ESTIMATED OFFSITES FACILITIES INVESTMENT

		Material & Labor
1.	Steam Generating System	$280,000
2.	Water Treating Facilities	200,000
3.	Fresh Water Supply	125,000
4.	Refinery Fuel System	300,000
5.	Cooling Water System	970,000
6.	Electric Power System	825,000
7.	Compressed Air System	240,000
8.	T.E.L. Blending	120,000
9.	Fire Fighting Equipment	710,000
10.	Refinery Flare & Blowdown System	300,000
11.	Oil Separation and Retention Pond	450,000
12.	Sewer System	600,000
13.	Telephone System	50,000
14.	Fencing and Gates	30,000
15.	Roads and Parking Areas	50,000
16.	Buildings	650,000
17.	Tankage	13,124,000
18.	Tankage Accessories	3,281,000
19.	Transfer Pumps	170,000
20.	Truck Load Racks	75,000

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Case I - Estimated Offsites (Cont'd.)

		Material & Labor
21.	Yard Piping	1,500,000
22.	Land - not included	---
23.	Docks and Wharf - not included	---
24.	Site Preparation	1,250,000
25.	Miscellaneous Field Costs	1,265,000
	Total Material and Labor	$26,565,000
	Contingencies, 15%	3,985,000
	Total Offsites	$30,550,000

PROCESSING AND ECONOMIC DATA
FOR A [illegible] REFINERY
TABLE XII
CASE II
ESTIMATED OFFSITES FACILITIES INVESTMENT

		Material & Labor
1.	Steam Generating System	$490,000
2.	Water Treating Facilities	350,000
3.	Fresh Water Supply	125,000
4.	Refinery Fuel System	300,000
5.	Cooling Water System	1,030,000
6.	Electric Power System	880,000
7.	Compressed Air System	240,000
8.	T.E.L. Blending	120,000
9.	Fire Fighting Equipment	710,000
10.	Refinery Flare & Blowdown System	300,000
11.	Oil Separation and Retention Pond	450,000
12.	Sewer System	600,000
13.	Telephone System	50,000
14.	Fencing and Gates	30,000
15.	Roads and Parking Areas	50,000
16.	Buildings	650,000
17.	Tankage	13,682,000
18.	Tankage Accessories	3,421,000
19.	Transfer Pumps	170,000
20.	Truck Load Racks	75,000

Case II - Estimated Offsites (Cont'd.)

21.	Yard Piping	1,750,000
22.	Land - not included	---
23.	Docks and Wharf - not included	---
24.	Site Preparation	1,500,000
25.	Miscellaneous Field Costs	1,349,000
	Total Material and Labor	$28,322,000
	Contingencies, 15%	4,248,000
	Total Offsites	$32,570,000

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED FLUID BED UNIT ENTRY
TABLE XIII
CASE I
ESTIMATED INITIAL INVENTORY REQUIREMENTS

	Barrels	Dollars
1- Charge Stocks		
Crude, 20 days inventory	2,000,000	$4,700,000
2- Products		
Gasoline		
Premium, 25 days inventory	286,800	$1,427,700
Regular, 25 days inventory	669,000	3,096,100
#1 Fuel Oil, 25 days inventory	167,500	652,600
#2 Fuel Oil, 25 days inventory	372,500	1,277,700
#6 Fuel Oil, 25 days inventory	611,000	1,314,200
Propane, 15 days inventory	36,200	107,400
Total	2,143,000	$7,875,700
3- Catalyst Initial Loading and a Spare Loading	Pounds	
F.C.C.	1,284,000	$231,100
Naphtha Unifiner	98,300	157,400
Distillate Unifiner	80,800	84,900
Platformer	153,800	838,300
Alkylation (HF & KOH)	126,600	32,900
Polymerization	76,400	22,900
Total	1,819,900	$1,367,500
4- Spare Parts	-	$1,077,600
Total		$15,020,800

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PLANO RICO REFINERY
NEW YORK, N. Y.
TABLE XIV
CASE II
ESTIMATED INITIAL INVENTORY REQUIREMENTS

	Barrels	Dollars
1- Charge Stocks		
Crude, 20 days inventory	2,000,000	$4,700,000
2- Products		
Gasoline		
Premium, 25 days inventory	196,500	978,400
Regular, 25 days inventory	458,500	2,122,000
Benzene, 30 days inventory	30,200	379,900
Toluene, 30 days inventory	34,700	262,000
C_8 Aromatics, 30 days inventory	36,200	227,800
Raffinate, 25 days inventory	130,600	527,900
Naphthalene, 30 days inventory	22,100	440,600
Mixed C_3's, 15 days inventory	58,100	172,300
Mixed C_4's, 15 days inventory	62,600	185,600
#2 Fuel Oil, 25 days inventory	496,800	1,703,900
#6 Fuel Oil, 25 days inventory	557,900	1,200,000
Total	2,084,200	$8,200,400
3- Catalyst Initial Loading and a Spare Loading	Pounds	
F.C.C.	1,632,000	293,800
Naphtha Unifiners	107,800	172,400
Distillate Unifiner	74,100	155,600
B-T-X Platformer	57,500	313,600
Hvy. Nap. Platformer	116,600	927,200
Hydeal	135,100	135,100
Total	2,123,100	$1,997,700
4- Spare Parts	---	$1,319,400
Total		$16,217,500

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] TO RICO REFINERY
TABLE XV
ESTIMATED STARTUP & WORKING CAPITAL

Section 1 - Startup Capital	Case I	Case II
A. Labor-60 Days Supervision	$267,200	$267,200
30 Days Operating & Training	64,100	72,400
B. Utilities-30 Days Startup & Training	250,500	336,300
Total Startup Capital to Depreciable Capitalization	$581,800	$675,900

Section 2 - Working Capital		
A. Charge Stock, 20 days inventory	$4,700,000	$4,700,000
B. Products, necessary inventory	7,875,700	8,200,400
C. Direct Operating Costs-30 days	791,300	862,100
Total Working Capital to Non-Depreciable Capitalization	$13,367,000	$13,762,500

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED HIGH HTGS REFINERY
TABLE XVI
ESTIMATED TOTAL INVESTMENT

	Case I	Case II
Initial Catalyst & Chemical Loading and Spare Parts	$2,445,100	$3,317,100
Process Investment	35,920,000	43,980,000
Offsites Investment	30,550,000	32,570,000
Startup and Working Capital		
a. Depreciable	581,800	675,900
b. Non-depreciable	13,367,000	13,762,500
Total	$82,863,900	$94,305,500

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PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

SECTION 5

Case I - Process Description and Yields

Introduction

Case I scheme is for processing 100,000 BSD of Tia Juana Medium Crude to produce normal petroleum fuels that will meet current and future markets as far as quality is concerned for the East Coast markets of the United States.

Block flow diagram No. 71769-00 show the general processing scheme that is utilized in Case I. The main considerations were to produce LPG, a gasoline with a reasonable provision for a future octane number increase and a No. 1 and No. 2 fuel oil that will meet general product specifications. The production of No. 6 fuel oil and pitch (and the other forementioned products) will be determined by the local market capacity of consuming pitch as an industrial fuel.

For example: If the quantity of pitch as shown produced in Case I cannot be consumed as a local industrial fuel there are several possible alternatives that could be used to reduce the quantity to meet current market demands.

a. The capacity and conversion level of the FCC unit could be chosen to produce sufficient cycle oil to cut the vacuum bottoms, after pitch viscosity breaking, to No. 6 fuel oil.

b. Maintain the capacity and conversion level of the FCC unit as presented in Case I using all the cycle oil and sufficient virgin distillate (500-650°F.) to cut the vacuum bottom, after viscosity breaking, to No. 6 fuel oil. This would lower the amount of No. 2 fuel oil for sale.

c. Virgin vacuum bottoms from Tia Juana Medium Crude is readily adaptable for producing asphalt. The amount of virgin vacuum bottoms routed into asphalt is determined by local markets for such items as (1) highway construction and repair programs (2) roofing materials, etc.

d. Virgin vacuum bottoms could be routed to a low pressure coking unit to produce petroleum coke and upgrade vacuum bottoms into more profitable items. Petroleum coke derived from Tia Juana Medium Crude has in general, properties that could be acceptable for several end uses of coke.

Process Flow

Crude Desalting

While the crude used for this study does not show an appreciable amount of salt, electrical desalting equipment is provided to enable crudes to be processed, which are less satisfactory in this regard.

Atmospheric Distillation

Whether or not one 100,000 BSD unit or 2-50,000 BSD units should be installed is a difficult question to decide at any time and must be studied and discussed in detail. Certainly the large oil companies favor large units. Cost wise, the differences between 1-100,000 BSD crude unit and 2-50,000 BSD crude units is about $4,000,000 more for the two units than the one unit of similar construction. While the single large unit has a cost advantage, requires less operating personnel and makes more efficient use of utilities, it will require large intermediate storage for charge stocks to be processed in down stream units when the crude unit is shut down and may also have the disadvantage, because of the vessel sizes, of having to have the vessels field fabricated whereas the small vessels of the smaller sized units may be shop fabricated.

Preflashing or prefractionation is chosen to give the most economical use of heat. A light straight run stabilizer is provided. The Tia Juana Medium light straight run in particular needs to be stabilized and while the stabilizer could be omitted with the light straight run stabilized in the FCC Gas Recovery unit, this would reduce operating flexibility. Only one grade of gasoline then could be produced.

A full boiling range naphtha, 180-400°F. is taken overhead from the atmospheric crude column and is processed in a Unifiner for sulfur removal and to further processing as described later. Light (400-500°F.) and middle (500-650°F.) distillates are taken as side stream from the crude column, and are processed together in a Unifiner for sulfur reduction, split again into their original boiling ranges and sent to product storage. The reduced crude from the bottom of the atmospheric crude column is sent to the vacuum unit.

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Vacuum Distillation

The function of this unit is to prepare vacuum gas oil as charge to the FCC unit. It should be designed carefully to keep entrainment of asphalt from the gas oil to a minimum and thus at the same time keep the metal contaminants, harmful to the FCC operation, at a minimum in the FCC feed. The vacuum pitch obtained from the bottom of the vacuum unit is sent to the visbreaking unit.

Visbreaking Unit

Visbreaking is particularly advantageous in a dual process function. It prepares distillate stocks and at the same time reduces the viscosity of residual bottoms so that less cutback material is required to meet No. 6 fuel oil specification. Light materials from this operation are sent to FCC Gas Recovery system for recovery of the C_3's and C_4's. The gasoline produced is combined with virgin naphtha and is treated in the Unifiner to become feedstock for further processing. The vacuum pitch is sold with cycle stock (FCC cycle oils) as No. 6 fuel oil or burned as a fuel within the refinery or other industrial consumers close to the refinery.

Fluid Catalytic Cracking and Gas Recovery

This system of Catalytic Cracking has been chosen as it has been most widely accepted in the industry and is the most representative. The function of this unit is to convert heavy distillate oils into high octane gasoline and to reduce the over-all refinery fuel oil production. Current designs are noted for simplicity, ease of operation and low operating and investment costs. The process also gives good yields of mixed C_3 and C_4 saturate and olefin compounds which can be used for alkylation, catalytic condensation or for petrochemical intermediates.

Charge stock for the FCC has been prepared by the vacuum unit. A conversion level of 65% have been used in this scheme. However, as mentioned in the introduction, if the pitch sales are not large, conversion level could be reduced for sufficient cycle oils to be produced for blending into No. 6 fuel oil.

The gas recovery section (gas concentration) may receive, in addition to the light produced from the FCC unit, light products from other refinery sources as straight run stabilizer

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overhead, Platforming debutanizer overhead and the Visbreaking light material. The Gas Recovery section produces fuel gas, mixed C_3's and C_4's that become charges for alkylation and polymerization processes, and a debutanized gasoline which is routed to the gasoline pool as a blending component.

Naphtha Unifining

An uncomplicated, easily operated process for eliminating sulfur, nitrogen and metallic impurities from petroleum distillates, Unifining provides a simple and economical answer to an operating problem that is frequently difficult and costly to solve by other methods. Also Unifining, will similtaneous saturate any olefin present in the feedstocks. It clearly removes impurities and prepares feed stocks of ideal properties for further processing.

Unifining works particularly well in combination with Platforming. It is ideal for pretreating Platformer feed stocks and the excess hydrogen from the Platformer is an excellent, low cost hydrogen source for the Unit.

The feed to the naphtha Unifiner is comprised of the full boiling range naphtha from the crude unit and the visbreaker gasoline. Sulfur reduction and olefin saturation occurs during this operation. Hydrogen required for these steps is recieved from the Platforming unit. H_2S and light materials produced during Unifining are stripped in the Unifiner stripper. The stripper bottoms then become charge to the Platforming unit.

Platforming Unit

This is one of the most widely used processes in the refining industry. In operation on a broad scale it has proved to be a practical and an economical process for upgrading low octane gasolines.

Platformer feed stock is received from the Unifiner stripper. Processing conditions are selected so that a 90 F-1 clear C_5^+ Platformate is obtained from the Platformer debutanizer and is routed to the gasoline pool as a high octane blending component. The debutanizer overhead material is sent to the FCC Recovery unit for recovery of propane, iso and normal butanes present in the streams. The net separator gas becomes a source of low cost hydrogen for the Unifining operation.

Distillate Unifining

This proposed method of distillate treating, where hydrogen is available, is based on Universal's considerable experience

in the Unifining of distillate oils. Sulfur reduction to meet specifications is the prime function of this operation and the required reduction is readily obtained.

Light virgin distillate (400-500°F.) and middle virgin distillate (500-650°F.) is obtained from the crude unit and becomes the feed stock for the Unifiner mainly for sulfur reduction. The two liquid streams are combined and with the necessary portion of Platformer net separator gas enter the Unifiner reactor system. The product after the Unifiner reactor is stripped and rerun to meet flash point specification and further split to give products as No. 1 and No. 2 fuel oil.

HF Alkylation

HF alkylation is a useful and economic process for the production of high octane motor gasoline blending component. This process is a catalytic method which combines olefinic (such as propylene, butylene, and amylenes), with an iso-paraffin (usually isobutane), to form a mixture of branched chain hydrocarbons of higher molecular weight known as alkylate. Alkylate is the principal component of high octane aviation gasoline.

A stream coming from the FCC Gas Recovery Unit contains propane, propylene, iso and normal butanes, and butylenes. As in normal operations, butylenes are usually the preferred olefins to be alkylated with the required quantity of iso butane. However, in the process scheme developed for this case, insufficient quantity of iso butane is available for alkylating all available butylenes. Therefore, it is assumed that the alkylation capacity is limited by this reason. The splitter acts to prepare the proper quantity of iso butane and butylene to be processed in the alkylation unit. The alkylate so produced is routed to the gasoline pool as a high octane blending stock. The normal butane that passes through the unit, not being involved in any chemical reaction, is blended in the gasoline pool not only for its good blending octane value but also to give the proper vapor pressure characteristics to the gasoline.

Catalytic Polymerization

This is another process designed to help the refiner utilize his facilities to the fullest profitable extent. With this process, the recoverable propylene and butylenes from a gas recovery unit are converted catalytical into a high octane gasoline blending component, known as motor polymer.

In this process chemo, the total quantity of available recoverable propylene (and butylenes that cannot be processed in the alkylation unit) become the feedstock for the catalytic condensation process. The resulting motor polymer is routed to the gasoline pool as a high octane blending stock. The propane that passes through the unit, unreacted, is routed to storage and is sold as liquid petroleum gases (LPG).

Merox

Merox Process is a fairly new process announced by Universal and is additional evidence of UOP's policy of providing the refining industry with every means for a well-rounded, profitable manufacturing operation. This process provides a low cost operation for treating gasoline and lower boiling fractions for removal of mercaptans, or sweetening heavier stocks by converting mercaptans to disulfides.

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED INTEGRATED LPG REFINERY
TABLE XVII
CASE I
ESTIMATED GROSS MANUFACTURING MARGIN

Products	B/D	$/Bbl.	¢/Gal.	$/D
Gasoline				
Premium	11,470	4.979	11.86	57,109
Regular	26,760	4.628	11.02	123,845
Total	38,230			190,954
#1 F.O.	6,700	3.896	9.28	26,103
#2 F.O.	14,900	3.430	8.17	51,107
#6 F.O.	24,440	2.151	5.12	52,570
Pitch	12,490	1.800	4.29	22,482
L.P.G. (C_3)	2,415	2.964	7.06	7,158
Value of Production	99,175			350,374
Charge				
Crude	100,000	2.350	5.60	235,000
Cost of Raw Material				235,000
Gross Manufacturing Margin				115,374

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVIII
CASE I
ESTIMATED REFINERY CONSOLIDATED YIELDS

Charge	B/D	Vol.%	#/Hr.	Wt.%
Tia Juan Medium Crude	100,000	100.0	1,300,075	100.00
Refinery Yield				
1. Gasolines				
$n\text{-}C_4$	1,815	1.8	15,465	1.19
Lt. St. Run	2,000	2.0	18,245	1.40
Platformate	18,435	18.4	210,620	16.20
F.C.C. Gasoline	12,070	12.1	134,145	10.32
Motor Alkylate	2,820	2.8	28,925	2.22
Motor Polymer	1,090	1.1	11,545	0.89
	38,230	38.2	415,945	32.22
2. #1 Fuel Oil	6,700	6.7	80,550	6.20
3. #2 Fuel Oil	14,900	14.9	184,765	14.21
4. #6 Fuel Oil	24,450	24.5	350,200	26.94
5. Pitch *	12,490	12.5	183,865	14.14
6. L.P.G. (C_3)	2,415	2.4	17,950	1.38
7. Fuel Gas, (F.O.E.)	3,530	3.5	41,205	3.17
8. Carbon Burned	-	-	22,595	1.74
Total	102,715	102.7	1,300,075	100.00

* Includes 1,195 B/D Pitch used to supplement refinery fuel gas

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PROCESSING AND ECONOMIC DATA
FOR A HYDROID PUERTO RICO REFINERY

TABLE XIX
CASE I
ESTIMATED CRUDE UNIT YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Tia Juana Medium Crude	27.1	100,000	100.0	1,300,075	100.00	7.429
Yields						
I.B.P.-180°F.	--	3,700	3.7	32,185	2.48	--
180 - 400°F.	55.5	19,200	19.2	211,645	16.28	6.299
400 - 500°F.	40.0	6,700	6.7	80,550	6.20	6.870
500 - 650°F.	34.8	14,900	14.9	184,765	14.21	7.085
650 - 1,000°F.	19.9	23,700	23.7	322,800	24.83	7.783
Vac. Botts.	8.6	31,800	31.8	468,130	36.00	8.412
		100,000	100.0	1,300,075	100.00	

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XX
CASE I
ESTIMATED VISBREAKING YIELD

Charge	°API	B/D	Vol.%	#/Hr.	Wt. %	#/Gal.
Vac. Bottoms	8.6	31,800	100.0	468,130	100.00	8.412
Yields						
H_2S				1,030	0.22	
H_2				45	0.01	
C_1				1,500	0.32	
$C_1^=$				610	0.13	
C_2				2,015	0.43	
$C_2^=$		250	0.8	1,920	0.41	
C_3		335	1.1	2,480	0.53	
$C_3^=$		335	1.1	2,950	0.63	
$i\text{-}C_4$		110	0.3	890	0.19	
$n\text{-}C_4$		135	0.4	1,170	0.25	
C_5-400°F.	56.0	2,930	9.2	32,205	6.88	6.283
Fuel Oil, 300 CS @ 210°F.	8.6	28,620	90.0	421,315	90.00	8.412
		32,715	102.9	468,130	100.00	

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XXI
CASE I
ESTIMATED PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/gal
Unifined Virgin 180-400°F.	55.5	19,200	86.8	211,645	65.72	6.299
Unifined Visbreaker 180-400°F.	56.0	2,930	13.2	32,205	34.28	6.283
	55.6	22,130	100.0	243,850	100.00	6.298

Yields					
H_2				3,195	1.31
C_1				4,680	1.92
C_2				6,485	2.66
C_3				8,705	3.57
C_4's		1,120	5.06	9,390	3.85
C_5's		1,120	5.06	10,240	4.20
Hexanes +		17,390	78.57	201,155	82.49
		19,630	88.69	243,850	100.00

Debut. Botts. - C_5+ Platformate

	B/D	°API	RVP	F-1 Cl	F-1 + 3cc
Total Bottoms	18,435	49.2	3.55	90.0	98.5

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY
TABLE XXII
CASE I
ESTIMATED F.C.C. YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Virgin Gas Oil	19.9	23,700	100.0	322,800	100.0	7.783
Yields						
H_2S				2,720	0.8	
H_2				365	0.1	
C_1				2,905	0.9	
C_2=				1,520	0.5	
C_2				2,720	0.8	
C_3=		1,450	6.1	11,040	3.4	
C_3		810	3.4	5,985	1.9	
C_4=		1,525	6.4	13,525	4.2	
i-C_4		1,125	4.7	9,250	2.9	
n-C_4		395	1.7	3,370	1.0	
C5-380°F. @90% Gas	54.0	12,070	50.9	134,145	41.6	
L.C.O. (610 F. @ 90%)	24.0	4,505	19.0	59,720	18.5	
HCO	20.0	2,610	11.0	35,510	11.0	
Cl. Sl.	10.0	1,195	5.0	17,430	5.4	
Coke				22,595	7.0	
				322,800	100.0	

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY
TABLE XXLII
CASE I
ESTIMATED GAS CONCENTRATION UNIT YIELDS

	Crude, #/Hr.	Platf. #/Hr.	F.C.C. #/Hr.	Visb., #/Hr.	Total, #/Hr.	Fuel Gas, #/Hr.	Btu/#	Recovered #/Hr.	Recovered B/D
H_2	---	75	365	45	485	485	61,029	--	--
C_1	---	865	2,905	1,500	5,070	5,070	23,886	--	--
C_2=	---	---	1,520	610	2,130	2,130	21,639	--	--
C_2	---	3,985	2,720	2,015	7,760	7,760	22,325	--	--
C_3=	---	---	11,040	1,920	12,960	1,945	21,047	11,015	1,445
C_3	4,815	6,325	5,985	2,480	19,605	2,940	21,664	16,665	2,350
C_4=	---	---	13,525	2,950	16,475	330	20,766	15,145	1,820
i-C_4	2,300	3,200	9,250	890	15,640	315	21,239	15,325	1,865
n-C_4	6,825	8,615	3,370	1,170	15,180	305	21,301	14,875	1,745
	13,940	17,105	50,680	13,580	95,305	21,280		74,025	9,125

Recovery Factors:

C_3's 85%
C_4's 98%

Fuel Gas - 1,885 Bbl. F.O.F.

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] BASE REFINERY
TABLE XXIV
CASE I
ESTIMATED ALKYLATION YIELDS

Charge

From F.C.C. Gas Con. Unit Splitter	B/D	#/Hr.
Butylene	1,610	14,280
Isobutane	1,865	15,325
Normal Butane	1,745	14,875
	5,220	44,480

Yields

Normal Butane	1,815	15,465
Motor Alkylate	2,820	28,925
Tar	10	90
		44,480

PROCESSING AND ECONOMIC DATA
FOR A [illegible] BBL/D REFINERY
TABLE XXV
Case I
ESTIMATED POLYMERIZATION YIELDS

Charge

From F.C.C. Gas Conc. Unit Splitter	B/D	#/Hr.
Propylene	1,445	11,015
Propane	2,250	16,665
Butylene	210	1,865
	3,905	29,545

Yields

Propane	2,415	17,950
Motor Polymer	1,090	29,545
		29,545

PROCESSING AND ECONOMIC DATA
FOR A [illegible] REFINERY

TABULATION
Case 1

ESTIMATED GASOLINE POOL

Components	B/D	Vol.%	F-1 cl	F-1+3cc	RVP
Lt. St. Run	2,000	5.23	74.4	92.7	42.25
Platformate	18,435	48.22	90.0	98.5	3.55
F.C.C. Gasoline	12,070	31.57	92.0	96.7	5.50
Motor Alkylate	2,820	7.38	96.0	106.0	3.4
Motor Polymer	1,090	2.85	95.7	99.6	2.0
$n\text{-}C_4$	1,815	4.75	100.0	105.0	85.0*
Total	38,230	100.0	90.9	98.5	10.0

*Volumetric Blending Value

T.E.L. Requirement to meet Pool Octane of 95.7 = 0.9 cc T.E.L./gal.

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] PUERTO RICO REFINERY
TABLE XXVII
CASE 1

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ESTIMATED H_2 PRODUCTION AND CONSUMPTION

Production

Platformer 22,130 B/D x 637 SCF/Bbl. =	14.09×10^6 SCF/D

Consumption*

Nap. Unifiner 22,130 B/D x 116 SCF/Bbl =	2.57×10^6 SCF/D
Distillate Unifiner 21,600 B/D x 110 SCF/Bbl. =	2.38×10^6 SCF/D
	4.95×10^6 SCF/D

*Consumption includes chemical and solution losses

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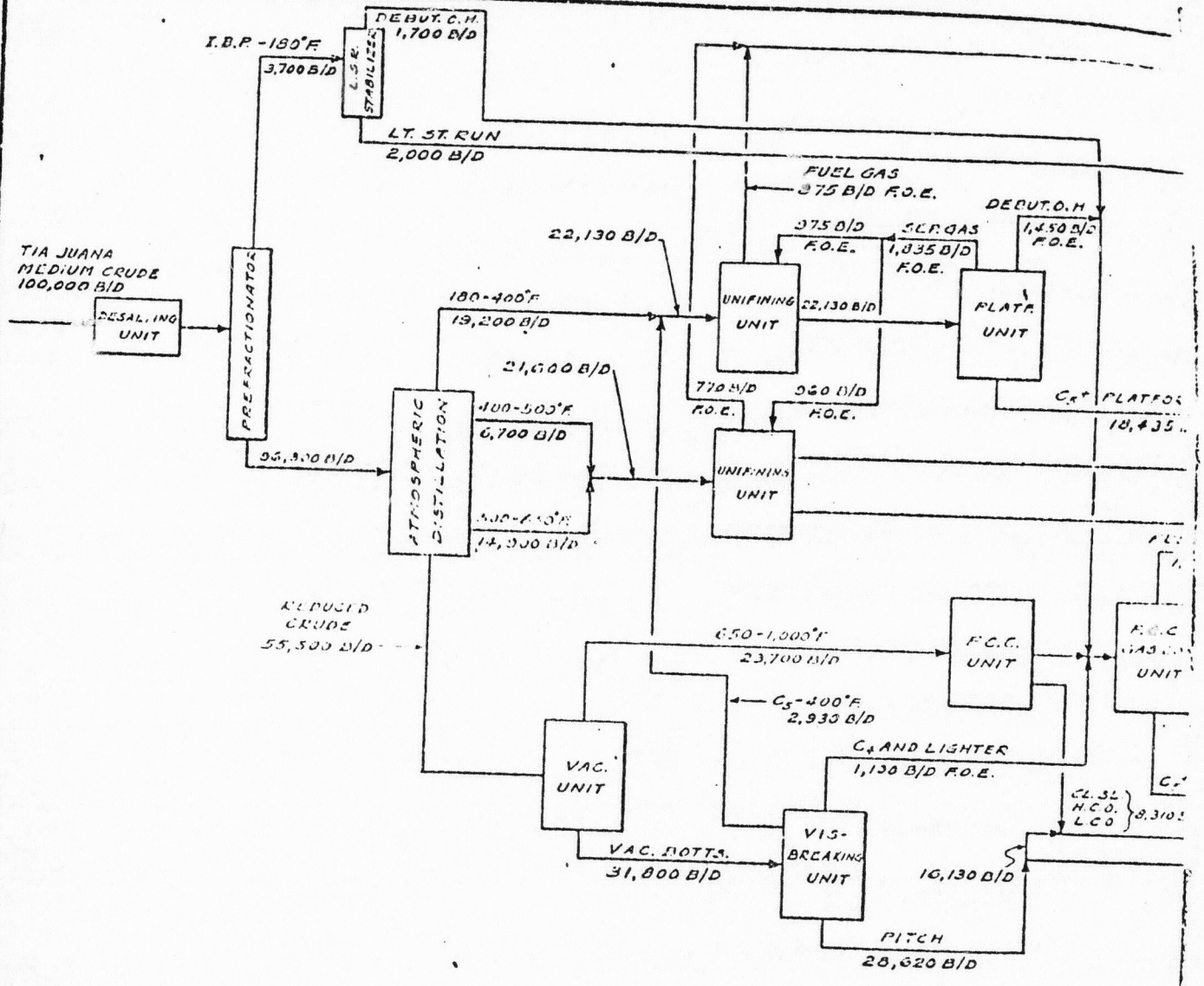

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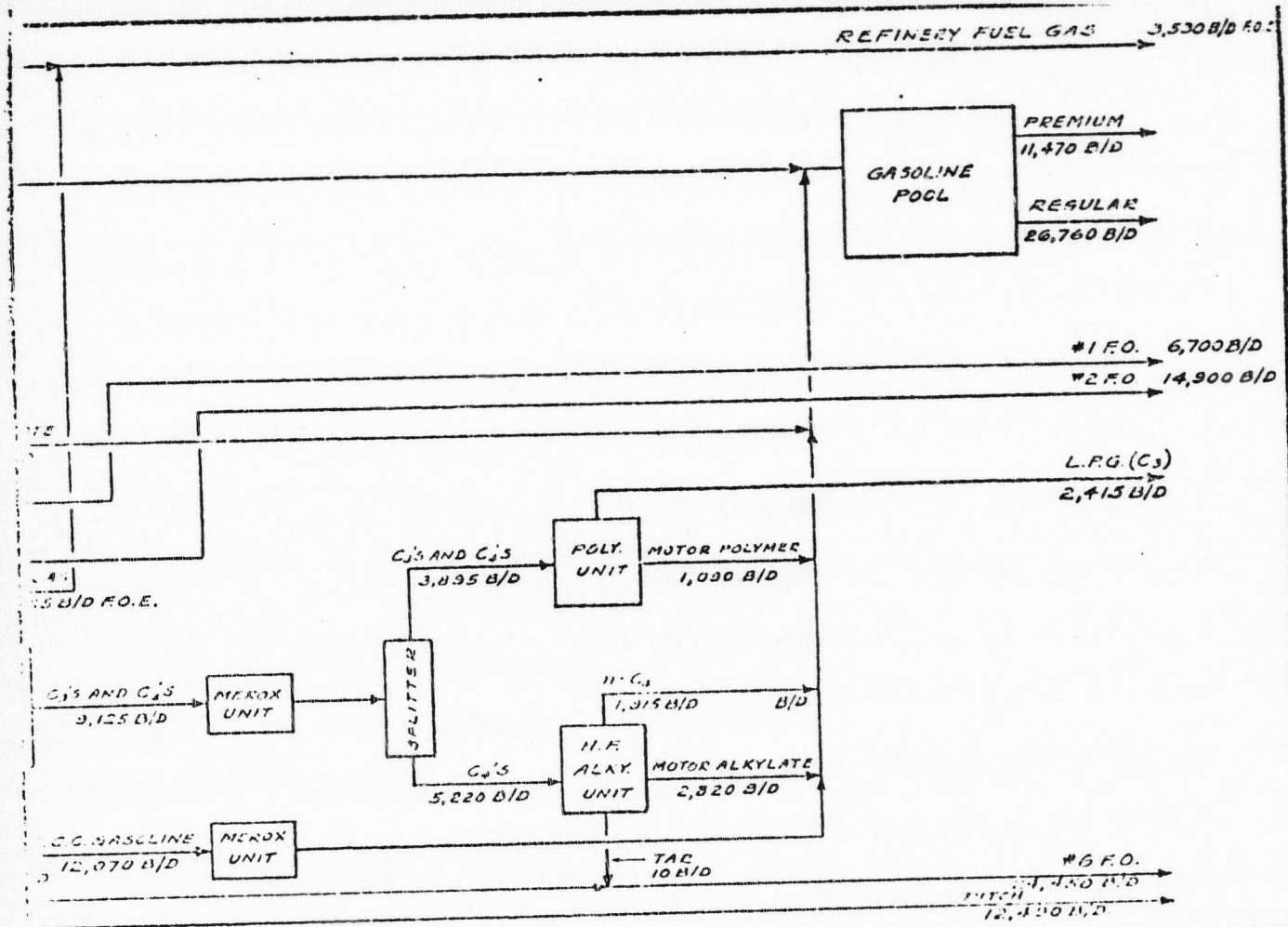

UNIVERSAL OIL PRODUCTS COMPANY
30 ALGONQUIN ROAD DES PLAINES, ILLINOIS, U.S.A.

BLOCK FLOW DIAGRAM
OF
NORMAL REFINERY FUELS
CASE I.
PROPOSED PUERTO RICO REFINERY

DR H.D.W. CK E.W.S. DWG NO 74769-C- 0 REV
APPR [illegible] DATE 11-12-41

REVISIONS						CHARGE
NO	DATE	DESCRIPTION	BY	CHKD	APP'D	

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

SECTION 6

Case II - Process Description and Yield

INTRODUCTION

Case II scheme if for processing 100,000 BSD of Tia Juana Medium Crude to produce normal petroleum fuels that will meet current and future markets as far as quality is concerned for the east coast markets of the United States. Also this scheme has been developed to produce some of the normal petrochemicals that are commonly derived from petroleum sources.

Block flow diagram No. 74770-00 show the general processing scheme that is utilized in Case II. The main considerations were to produce normal petroleum fuels that will meet general product specifications as well as producing petrochemical as derived from petroleum sources. The petrochemicals so produced are common materials that the modern day refinery can readily obtain without upsetting his petroleum fuels production.

As in Case I, the production of No. 6 fuel oil and pitch in this case is determined by local markets for pitch. The same alternatives as discussed in Case I apply here in Case II.

PROCESS FLOW

Crude Desalting

Same general statement as presented in Case I apply here.

ATMOSPHERIC DISTILLATION

Same general statements as presented in Case I, first two paragraphs apply here. However, the various fractions taken off the crude tower are different than Case I.

A light naphtha, 165-270°F. is taken overhead from the atmospheric crude column and is processed in a Unifiner for sulfur removal and is further processed as described later. A heavy naphtha, 270-450°F. is taken as a side stream from the crude column and is processed in a Unifiner for sulfur removal and to further processing as described later. A middle

distillate (450-650°F.) is taken as a side stream from the crude tower, processed in a Unifiner for sulfur reduction and sent to storage as a finished product. The reduced crude from the bottom of the crude tower is sent to vacuum unit.

VACUUM DISTILLATION

Same general statements as presented in Case I apply here.

VISBREAKING UNIT

Same general statements as presented in Case I apply here. However, the visbreaker gasoline is split into two fractions, a C5-270°F. and a 270-400°F. material. Each fraction is joined with the respective virgin naphtha fraction, processed in a Unifiner for sulfur reduction and olefin saturation, and then to further processing as described later.

FLUID CATALYTIC CRACKING AND GAS RECOVERY UNITS

Same general statements as presented in Case I apply here. A conversion level of 70% has been used in this scheme, for maximizing light olefin production. This conversion level was established for maximum allowable regenerator temperature.

LIGHT AND HEAVY NAPHTHA UNIFINING UNITS

Same general statements as presented in Case I apply here. The feeds to each of the Unifiners are comprised of the respective boiling range virgin naphthas and the visbreaker gasolines. Sulfur reduction and olefins saturation occurs during this operation.

B-T-X PLATFORMING AND HEAVY NAPHTHA PLATFORMING UNITS

Same general statements as presented in Case I apply here. Under proper operating conditions, Platforming fits well into the growing demand for petrochemicals as it is highly efficient for producing a material that contains aromatics such as benzene, toluene and xylenes and these can be readily extracted from the Platformate. As in this scheme, a Unifined naphtha in the boiling range of 165-270°F. is the feed stock for B-T-X Platforming operations. A depentanized Platformate is obtained and this becomes feed stock to a Udex unit as described later.

A C_5's and C_4's fraction is recovered and sent to the gasoline pool as a blending component. The depropanizer overhead material is sent to the FCC Gas Recovery Unit for recovery of propane. The net separate gas becomes a source of low cost hydrogen for the Unifining operation.

Within a recent period, under proper operating conditions, it has been found that the Platforming process may produce a material from which naphthalene could be derived. As in this scheme, a Unifined naphtha in the boiling range of 270-450°F. is the feedstock for heavy naphtha Platforming operations. A total depropanized Platformate is obtained which is rerun into a C_4-390°F. and a 390-E.P.°F. fraction. The C_4-390°F. fraction is routed to the gasoline pool as a blending component. The 390-E.P. fraction becomes a feedstock for further processing as described later for naphthalene production. The depropanizer overhead material is sent to the FCC Gas Recovery Unit for recovery of propane. The net separator gas becomes a source of low cost hydrogen for the naphthalene operation.

DISTILLATE UNIFINING

Same general statements as presented in Case I apply here. The middle virgin distillate (450-650°F.) as obtained from the crude column combined with a necessary portion of the B-T-X Platformer net separator gas into the Unifiner reactor system. Sulfur reduction in the distillate fraction is the prime purpose of this operation. The product after the Unifiner reactor is stripped and rerun to meet flash point specification to give a product as No. 2 fuel oil.

UDEX EXTRACTION AND B-T-X RECOVERY UNIT

The UOP Udex process is designed to prepare high purity aromatics from catalytic reformate. The Udex process has been proved commercially to be an outstanding method for the preparation of aromatics of purities not previously attained. The aromatic products of the Udex process will not only meet the established ASTM nitration grade specifications but will exceed them. Nitration grade benzene has a minimum solidification point of 4.85°C. The benzene produced commercially from catalytic reformate processed in Udex units have consistently been well above the 5.40°C solidification point. The toluene fraction will have comparable freedom from paraffin impurities. High aromatic product purities are attained which maintains high recovery efficiencies. The benzene recovery efficiency attained in commercial Udex operation has been well above 99%.

The feedstock for the Udex unit in this proposed scheme is the debutanized Platformate obtained from the B-T-X Platforming operation. Through the extraction step, the extract product so obtained has a high purity aromatic content.

However, the extract contains traces of unsaturates, which would limit the purity of the final products and may also contain traces of residual non-hydrocarbon compounds which would spoil the acid-wash color test of the final products. To destroy these trace impurities the extract is processed through Attapulgas or similar clay before final distillation.

Redistillation of the product is accomplished in three columns in succession making pure benzene and toluene respectively as overhead products, a C_8 aromatic fraction as overhead product and a C_9 plus aromatics product off the bottom of the xylene column.

The isomer distribution in the C_8 aromatic fraction derived from petroleum stocks is approximately:

	Vol. %
ethylbenzene	20
p-xylene	18
m-xylene	42
o-xylene	20

The raffinate obtained from the extraction step is highly paraffinic and needs very little treatment before it is sent to storage. It can be used as a low octane blending component, a jet fuel blending component, or a charge stock for an ethylene cracking process.

HYDEAL

The Hydeal Process is a new process recently announced by Universal. This process is designed for the conversion of alkylbenzenes to benzene or alkylnaphthalenes to naphthalene.

The Hydeal unit proposed for this scheme is designed to convert alkylnaphthalenes to naphthalene. Feed stock is derived from the Heavy Naphtha Platforming operation. The 390-E.P.F. Platformate fraction usually contains sufficient quantities of alkylnaphthalenes for economical conversion of

these compounds into naphthalene. Also present in these feedstocks are some alkylbenzenes that are converted to benzene. The hydrogen source for this reaction is the net separator gas from the Heavy Naphtha Platforming operation.

MERCX

Same general statements as presented in Case I apply here.

PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

TERMINAL ZAPATA

CASE 1A

ESTIMATED GROSS MANUFACTURING MARGIN

Products	B/D	$/Bbl.	¢/Gal.	$/D
Gasoline				
Premium	7,860	4.979	11.86	39,135
Regular	18,340	4.628	11.02	84,878
Total	26,200			124,013
Benzene	1,005	12.60	30.00	12,663
Toluene	1,155	7.56	18.00	8,732
C8 Aromatics	1,205	6.30	15.00	7,592
Raffinate	5,225	4.041	9.62	21,114
Naphthalene (¢/#)	735	-	(5.0)	14,668
Mixed C_3's	3,875	2.964	7.06	11,486
Mixed C_4's	4,175	2.964	7.06	12,375
#2 Fuel Oil	19,870	3.430	8.17	68,354
#6 Fuel Oil	22,315	2.151	5.12	48,000
Pitch	13,445	1.800	4.29	24,201
Value of Production	99,205			353,018
Charge				
Crude	100,000	2.350	5.60	235,000
Cost of Raw Material				235,000
Gross Manufacturing Margin				118,018

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED [illegible] REFINERY
TABLE XXIX
CASE C1
ESTIMATED REFINERY CONSOLIDATED YIELDS

Charge	B/D	Vol.%	#/Hr.	Wt.%
Tia Juan Medium Crude	100,000	100.0	1,300,075	100.00
Refinery Yield				
1. Gasolines				
Lt. St. Run	3,555	3.6	31,585	2.43
C_4-390°F. Platformate	10,340	10.3	118,235	9.09
F.C.C. Gasoline	12,305	12.3	136,730	10.52
	26,200	26.2	286,550	22.04
2. Benzene	1,005	1.0	12,925	0.99
3. Toluene	1,155	1.2	14,465	1.11
4. C_8 Aromatics	1,205	1.2	15,045	1.16
5. Raffinate	5,225	5.2	53,960	4.15
6. Naphthalene	735	0.7	12,240	0.94
7. Mixed C_3's	3,875	3.9	29,045	2.23
8. Mixed C_4's	4,175	4.2	35,880	2.76
9. #2 Fuel Oil	19,870	19.9	240,775	18.52
10. #6 Fuel Oil	22,315	22.3	321,200	24.71
11. Pitch*	13,445	13.4	197,925	15.22
12. Fuel Gas (F.O.E.)	2,365	2.4	51,335	3.96
13. Carbon Burned	-	-	28,730	2.21
Total	101,570	101.6	1,300,075	100.00

* Includes 1,850 B/D Pitch used to supplement refinery fuel gas.

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED [illegible] NICO REFINERY
TABLE XXX
CASE II
ESTIMATED CRUDE UNIT YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Tia Juana Medium Crude	27.1	100,000	100.0	1,300,075	100.00	7.429
Yields						
I.B.P.-165°F.	--	3,400	3.4	29,515	2.27	--
165-270°F.	62.0	8,500	8.5	90,455	6.96	6.087
270-450°F.	45.4	12,800	12.8	149,185	11.48	6.660
450-650°F.	38.6	19,800	19.8	239,990	18.46	6.926
650-1,000°F	19.9	23,700	23.7	322,800	24.83	7.783
Vac. Botts.	8.6	31,800	31.8	468,130	36.00	8.412
		100,000	100.0	1,300,075	100.00	

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY
CASE II
ESTIMATED VISBREAKING YIELD

E 103

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Vac. Bottoms	8.6	31,800	100.0	468,130	100.00	8.412
Yields						
H_2S				1,030	0.22	
H_2				45	0.01	
C_1				1,500	0.32	
C_2 =				610	0.13	
C_2				2,015	0.43	
C_3 =		250	0.8	1,920	0.41	
C_3		335	1.1	2,480	0.53	
C_4 =		335	1.1	2,950	0.63	
i-C_4		110	0.3	890	0.19	
n-C_4		135	0.4	1,170	0.25	
C_5-400°F	56.0	2,930	9.2	32,205	6.88	6.283
Fuel Oil, 300 C_5 @ 210°F	8.6	28,620	90.0	421,315	90.00	8.412
		32,715	102.9	468,130	100.00	

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY
TABLE XXXII
CASE II
ESTIMATED B-T-X - PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Unifined Virgin 165-270°F.	62.0	8,500	86.3	90,455	86.37	6.087
Unifined Visbreaker 165-270°F.	63.4	1,350	13.7	14,280	13.63	6.044
	62.4	9,850	100.0	104,735	100.00	6.075

Yields

H_2			1,615	1.54
C_1			285	0.27
C_2			1,290	1.23
C_3	406	4.12	3,005	2.87
C_3's	586	5.95	4,860	4.64
C_4's	540	5.48	4,860	4.64
C_5 Paraffins	1,369	13.90	13,050	12.46
C_6 Paraffins	1,326	13.46	13,090	12.50
C_7 Paraffins	1,027	10.43	10,430	9.96
C_8 Paraffins	358	3.63	3,695	3.53
C_9 Paraffins	201	2.04	2,180	2.08
Methyl Cyclopentane	29	0.29	325	0.31
Cyclohexane	114	1.16	1,265	1.21
C_7 Naphthenes	48	0.49	545	0.52
C_8 Naphthenes	29	0.29	315	0.30
C_9 Naphthenes	426	4.32	5,405	5.16
Benzene	1,204	12.22	15,070	14.39
Toluene	1,340	13.60	16,715	15.96
C_8 Aromatics	532	5.40	6,735	6.43
C_9+ Aromatics	9,535	96.78	104,735	100.00

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] REFINERY
TABLE XXXIII
CASE II
ESTIMATED UDEX YIELDS

Charge

Debenteniged Platformate - see Table XXXIII, Estimated B-T-X Platforming yields

Yields

Extract

Platforming Yields, B/D		Recovery Factors	Recovered
Benzene	426	99%	422
Toluene	1,204	96%	1,156
C_8 Aromatics	1,340	90%	1,206

Raffinate	B/D
C_6 Paraffins	1,369
C_7 Paraffins	1,326
C_8 Paraffins	1,027
C_9+ Paraffins	358
Methyl Cyclopentane	201
Cyclohexane	29
C_7 Naphthenes	114
C_8 Naphthenes	48
C_9 Naphthenes	29
Benzene	4
Toluene	48
C_8 Aromatics	134
C_9+ Aromatics	532

General Properties of Raffinate

F-1 Cl	62.0
F-1 + 3cc	80.0
RVP	3.5

PROCESSING AND ECONOMIC DATA
FOR A HOKKAIDO PETROCHEMICAL REFINERY
TABLE XXXIV
CASE 4

E 106

ESTIMATED HEAVY NAPHTHA PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Unifined Virgin 270-450°F	45.4	12,800	89.0	149,185	89.27	6.660
Unifined Visbreaker 270-400°F	50.2	1,580	11.0	17,925	10.73	6.483
	45.9	14,380	100.0	167,110	100.00	6.641

Yields					
H_2			2,105	1.26	
C_1			3,695	2.21	
C_2			4,730	2.83	
C_3			6,385	3.82	
C_3's	825	5.75	6,935	4.15	
C_5's	820	5.70	7,505	4.49	
Reformate+	11,075	77.03	135,755	81.24	
	12,720	88.48	167,110	100.00	

Debcon. Bottc - C_4+Platformate

	B/D	°API	RVP	F-1 Cl	F-1 + 3cc
Total Bottoms	12,410	42.1	6.07	94.9	99.8

Platformate Split	I	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
C_4 - 390° F. Platformate	.8	10,340	83.3	118,235	80.23	6.534
390-E.P. Platformate	15.0	2,070	16.7	29,140	19.77	8.044
	42.1	12,410	100.0	147,375	100.00	6.786

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] PLUS HYDEAL COMPLEX
TABLE XXXV
CASE II
ESTIMATED NAPHTHALENE HYDEAL YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Heavy Platformate	15.4	2,070	100.0	29,140	100.00	8.044
H_2 (710 SCF/100#)	--	--	--	1,100	3.78	--
				30,240	103.78	
Yields						
Benzene	28.3	585	28.3	7,575	26.00	7.375
Naphthalenes				12,240	42.00	
Hvy. Aromatics	31.0	70	3.3	875	3.00	7.251
Fuel Gas (methane)				9,550	32.78	
				30,240	100.00	

Fuel Gas* - 1,970 Bbl. F.O.E.

* Fuel Gas contains components both from Hydeal Operations and the Hvy. Nap. Platformer separator gas.

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] REFINERY
CASE IV
CASE II
ESTIMATED F.C.C. YIELDS

E 108

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Virgin Gas Oil	19.9	23,700	100.0	322,800	100.00	7.783
Yields						
H_2S				2,720	0.8	
H_2				350	0.1	
C_1				3,740	1.2	
$C_1=$				1,990	0.6	
C_2				3,050	0.9	
$C_3=$		1,625	6.9	12,370	3.8	
C_3		845	3.6	6,260	2.0	
$C_4=$		1,760	7.4	15,600	4.8	
i-C_4		1,150	4.9	9,450	2.9	
n-C_4		470	2.0	4,000	1.3	
C_5-380°F.@ 90% gas	54.0	12,305	51.9	136,730	42.4	
L.C.O. (610°F.@ 90%)	22.0	4,280	18.1	57,460	17.8	
HCO	19.0	1,675	7.1	22,920	7.1	
Cl. Sl.	9.0	1,185	5.0	17,430	5.4	
Coke				28,730	8.9	
				322,800	100.00	

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY
TABLE XXXVII
CASE II
ESTIMATED GAS CONCENTRATION UNIT YIELDS

	Crude, #/Hr.	Kwgr. Nap. Platf., #/Hr.	B-T-X Platf., #/Hr.	F.C.C., #/Hr.	Visb., #/Hr.	Total #/Hr.	Fuel Gas, #/Hr.	Btu/#	Recovered #/Hr.	Recovered B/D
H_2	---	40	25	350	45	460	460	61,029	--	--
C_1	---	430	30	3,740	1,500	5,700	5,700	23,386	--	--
$C_2^=$	---	---	---	1,990	610	2,600	2,600	21,639	--	--
C_2	---	1,930	480	3,050	2,015	7,475	7,475	22,325	--	--
$C_3^=$	---	---	---	12,370	1,920	14,290	2,145	21,047	12,145	1,595
C_3	4,815	4,325	2,000	6,260	2,480	19,880	2,980	21,664	16,900	2,280
$C_4^=$	---	---	---	15,600	2,950	18,550	370	20,766	18,180	2,050
$i\text{-}C_4$	370	335	375	9,450	890	11,370	225	21,239	11,145	1,355
$n\text{-}C_4$	850	410	260	4,900	1,170	6,690	135	21,301	6,555	770
	6,035	7,470	3,120	56,810	13,580	87,015	22,090		64,925	6,050

Recovery factors:

C_3's 85%
C_4's 90%

Fuel Gas - 1,950 Bbl. F.O.E.

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PROCESSING AND ECONOMIC DATA
FOR [illegible] REFINERY
CASE VIII
PART II

E 110

ESTIMATED GASOLINE POOL

Components	B/D	Vol.%	F-1 cl	F-1+3cc	RVP
Lt. St. Run	3,555	13.6	88.5	100.6	34.47
C_4 - 390°F. Platformate	10,340	39.5	92.5	98.6	7.00
C_5^+ F.C.C. Gasoline	12,305	46.9	92.0	96.8	5.50
	26,200	100.0	91.7	98.0	10.0

T.E.L. Requirement to meet Pool Octane of 95.7 = 1.0 cc T.E.L./gal.

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PROCESSING AND ECONOMIC DATA
FOR A [illegible] REFINERY
TAB [illegible]
Case 11

ESTIMATED H_2 PRODUCTION AND CONSUMPTION

Production

B-T-X Platformer	9,850 B/D x 729 SCF/bbl. =	7.18×10^6	SCF/D
Hvy. Nap. Platformer	14,390 B/D x 647 SCF/bbl. =	9.31×10^6	SCF/D
		16.49×10^6	SCF/D

Consumption*

Lt. Nap. Unifiner	9,850 B/D x 108 SCF/Bbl. =	1.06×10^6	SCF/D
Hvy. Nap. Unifiner	14,390 B/D x 117 SCF/Bbl. =	1.68×10^6	SCF/D
#2 F.O. Unifiner	19,800 B/D x 126 SCF/Bbl. =	2.49×10^6	SCF/D
Hydeal Unit	2,070 B/D x 4,498 SCF/Bbl =	9.31×10^6	SCF/D
		14.54×10^6	SCF/D

*Consumption includes chemical and solution losses

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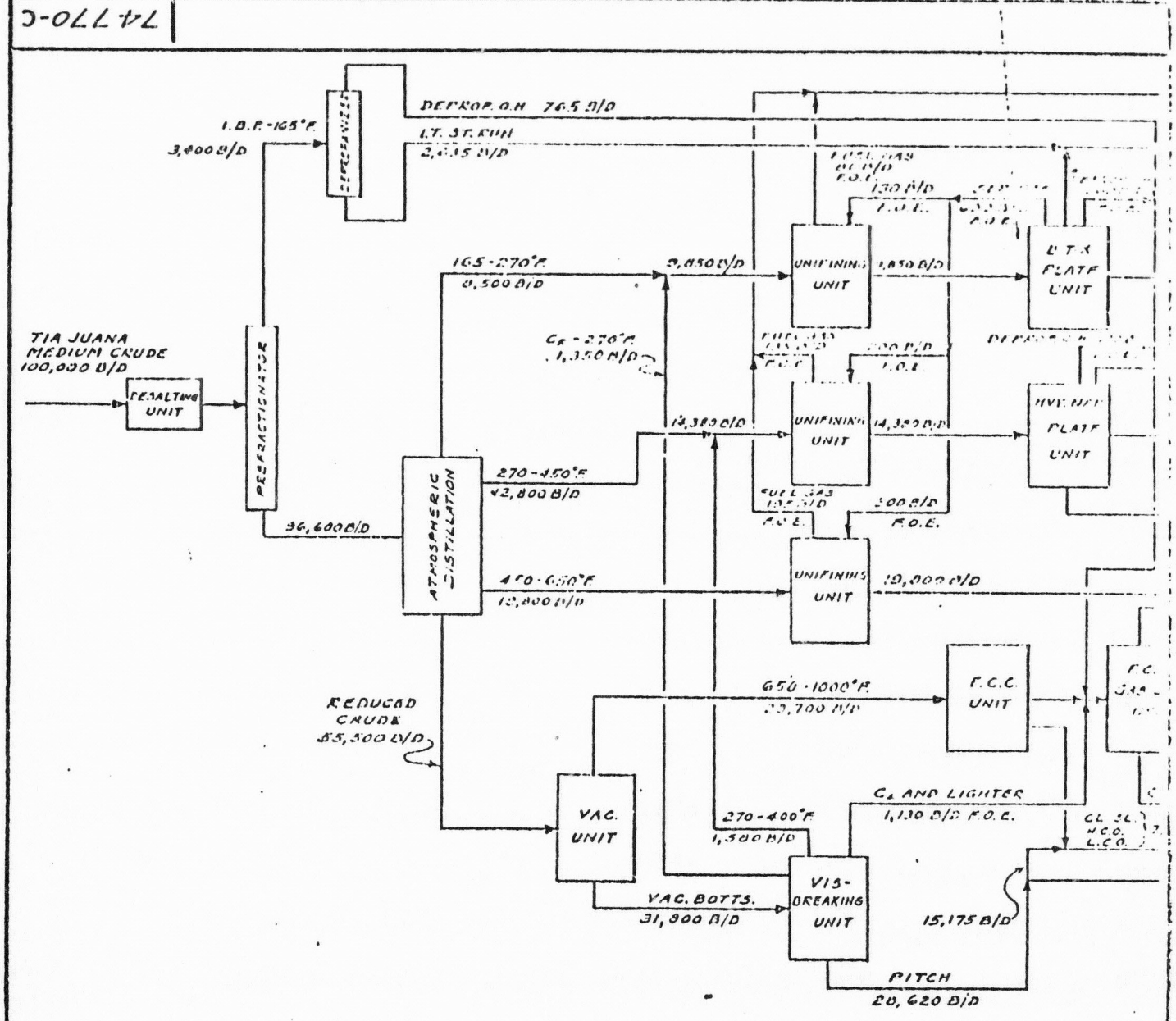

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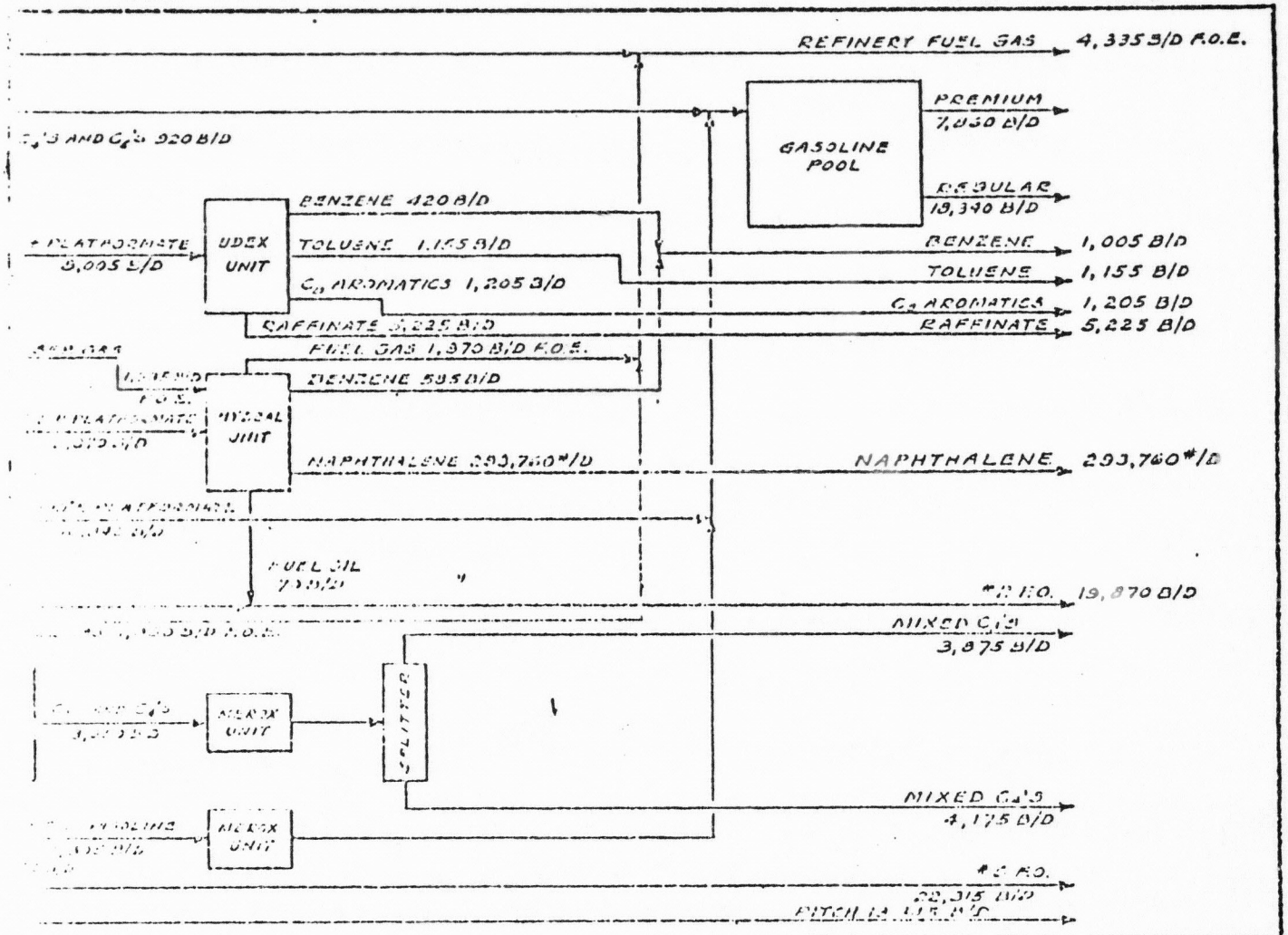

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NO.	DATE	DESCRIPTION	BY	CH	APP'D	TYPE

U.O.P.Co.

UNIVERSAL OIL PRODUCTS COMPANY
30 ALGONQUIN ROAD DES PLAINES, ILLINOIS, U.S.A.

BLOCK FLOW DIAGRAM
OF
NORTHAL REFINERY FUELS AND PETROCHEMICALS
CASE II,
PROPOSED PUERTO RICO REFINERY

JR H.D.W. CH C.F.S. DWG NO 74770-C- 0 REV
APPR [illegible] DATE 12-13-61

UOP-2-217

PX-631-6 vol. 7 & 7.

E 114

[redacted]

SECTION 7

Possible Petrochemical Complex

Introduction

In this section of the report an attempt has been made to present a scheme that is one of many open for an overall petrochemical complex based on the petrochemical derived from Case II operations. The overall petrochemical complex visualized is shown on the attached block flow diagram, Dwg. No. 7-[illegible], and consists of essentially two major processing sequences:

1. Aromatic Derived Chemicals
2. Olefin Derived Chemicals

There is some overlapping of the two divisions for both aromatic and olefin compounds are used jointly as feedstocks to some of the units shown in the scheme.

The efficient operation of each process sequence is a major factor for superior product quality and high on-stream operating factors in the secondary processes producing finished products. It may be concluded that careful selection of well-established processes and architect engineers is a prime requisite for the successful economic culmination of a petrochemical project of the scope and magnitude that is projected in this report.

There is only one company which offers as wide a variety of competitive processes having commercial application throughout the world. Universal Oil Products Company offers most of the processes required to produce the primary petrochemicals visualized in this study. The commercial experience required to design an efficient and economical petrochemical complex is present at Universal. Moreover, Universal has the expert personnel geared to train the operators required to operate and maintain an efficient organization. And, Universal is obligated by its process license agreements to maintain the competitive nature of its plants by making available to the licensee advances in the technology as they are made. Universal working closely with your selected prime contractor forms a closely knit team, that assures proper design, construction and operation of the proposed facilities.

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Aromatics Hydrofining

The Hydrar process is a new process recently announced by UOP. This process is designed for the conversion of [illegible] aromatics or olefin-free distillates as naphthalene feed typified in Case II herein. The toluene to benzene plant has received a great deal of attention with several commercial units on-stream at this time and several other units to be on-stream later this year or early 1964.

The Hydeal unit proposed in this petrochemical complex is designed to convert toluene to benzene. The hydrogen source could be from a Platforming unit or hydrogen generating facilities. The toluene feed is derived from the Udex unit as proposed in Case II. There exist an integration of the Udex and Hydeal aromatic fractionation sequence that could be used to reduce the investment requirements and operating costs.

The UOP Hysyan Process is the only commercially available process for synthesizing cyclohexane having the anticipated quality indicated by freeze point of greater than 5°C. Two commercial units are now on-stream, one designed to operate on Udex or Isomar feed. This unit has achieved the production of cyclohexane having a freeze point as high as 6.1°C. Product quality will meet or exceed the following specifications.

Cyclohexane

Solidifying	> 5°C.
Benzene Content	0.1% maximum by wt.
Organic Chloride content	1 ppm maximum
Saybolt Color	+30
Sulfur	10 ppm maximum
Boiling Range	> 79.5°C. Initial
Non-Volatile Matter	< That in benzene feed
Specific Gravity	0.777 to 0.784
Reid Vapor Pressure	3.5 psig maximum

The Hydrar unit proposed would be designed to convert either or both the benzene from the Udex or Hydeal operations. The hydrogen source could be from a Platforming unit or hydrogen generating facilities.

The C_8 aromatic fraction obtained from Case II Udex operation contains the following approximate isomer distribution:

	Vol.%
ethyl benzene	20
p-xylene	18
m-xylene	42
o-xylene	20

By the proper separation and fractionation operations the C_8 aromatic fraction can be separated into the four chemical groups of a high purity content. Therefore, each of the compounds could be routed to further processing operations giving a wider petrochemical complex.

Olefin Derived Chemicals

A UOP Catalytic Condensation Unit is proposed to produce nonenes, dodecenes, and heptenes which are chemical intermediates for further processing for OXO chemicals or in the case of dodecenes partial feedstock for final sulfonated detergents as described later. For the condensation unit, processing conditions would be selected to maximize the yields of each intermediate plus lesser amounts of light and heavy by-products over UOP Solid Phosphoric Acid Catalyst. For the nonenes and dodecenes operation, the proposed feedstock would be the mixed C_3's fraction obtained after splitting the mixed C_3's and C_4's stream from Case II Gas Recovery Unit. The feedstock for the heptenes would be the mixed C_3's - C_4's fraction or the separate streams depending on the alternative usage of the streams.

Product quality will meet the following specifications:

Heptenes

	Min.	Max.
Distillation Range ASTM D-1078		
IBP	86.0°C (186.8°F)	
DP		102.0°C (215.6°F)
Total Olefins, Vol.%	95.0	
Analysis of Olefins, Vol.%		
C_6		
C_7	95.0	
C_8		
Sulfur, ppm by weight		10
Chlorides, ppm by weight		10
Peroxide (active oxygen) ppm		25
Inhibitor (TBC) ppm	100	
Color, Saybolt	25	

Nonylene (Tripropylene)

	Min.	Max.
Distillation Range, ASTM D-1078		
IBP	137.5°C (279.5°F)	
DP		146.1°C (295°F)
% evaporation @ 279°F		6.0
Total Olefins, Vol.%	98.0	
Analysis of Olefins, Vol.%		
C_8		0.3
C_9	94.0	
C_{10}		5.7
Sulfur, ppm by weight		10
Chlorides, ppm by weight		10
Peroxide (active oxygen) ppm		25
Inhibitor (TBC), ppm	100	

Dodecenes (Tetrapropylene)

Distillation Range ASTM D-1078		
IBP	180°C (356°F)	
DP		205°C (401°F)
Total Olefins, Vol.%	98.0	
Analysis of Olefins, Vol.%		
C_{11}		6.0
C_{12}	90.0	
C_{13}		4.0
Sulfur, ppm by weight		10
Chlorides, ppm by weight		10
Peroxide (active oxygen), ppm		25
Inhibitor (TBC), ppm	100	

The mixed C's available from Case II are the basis for butadiene manufacture and motor aviation alkylate manufacture. Use of butylene extraction, iso butylene extraction, butylene dehydrogenation and butadiene extraction, has several advantages which are particularly significant when the dual objectives of butadiene and alkylate production are derived.

Product quality from the butadiene manufacture and aviation alkylate will meet the following specifications.

Aviation Alkylate

Will meet ASTM designation D 910-57-T for grade 115/145 aviation gasoline.

Butadiene

C_3's	0.3
Butadiene	[illegible] * minimum
Isobutylene	0.2
N-butane	1.0
	100.0

The mixed C_3's and benzene available from Case II are the basis for phenol and acetone production. In considering the steps necessary to convert these raw materials into high purity phenol and acetone, the operations is done in two steps. The propylene contained in the mixed C_3's is alkylated with benzene via the UOP Catalytic Condensation Process using UOP solid phosphoric acid catalyst. The design of this unit is based on experience gained from a large number of commercial installations ranging in cumene production rates from 100 to 1,600 barrels per stream day. It should be noted that the process is quite versatile, being able to produce, besides cumene, nonenes, dodecenes, heptenes, motor polymer and other specialty polymers.

The Unisir Cumene Oxidation Process is a method for the preparation of phenol and acetone by the oxidation of cumene to the hydroperoxide followed by a cleavage step. The Unisir process has been proved commercially to be an economical method for the production of phenol and acetone in high yields.

Products specifications are as follows:

Phenols

Solidification Point (anhydrous basis)	40.6°C. Min.
Non-Volatile Residue, Wt.%	0.02 Max.

Acetone

Purity, Wt.%	99.5 Min.
Other specifications equal to or exceeding ASTM Designation D 329-58	

Again the mixed C_3's and benzene available from Case II are the basis for other petrochemical material. Two basic process steps are involved in the production of detergent alkylate ready for sulfonation into finished detergent. The first of these is the Catalytic Condensation process unit using UOP's Solid Phosphoric Acid Catalyst for the production

of dodecene (tetrapropylene). This material is an intermediate product, which is used as feed to an olefin - aromatic alkylation unit. By-products from the polymerization operation include minor amounts of light and heavy polymers.

The dodecene (or tetramer) is alkylated with benzene, using HF as catalyst, to produce detergent alkylate (dodecylbenzene). The by-product of the alkylation operation include minor amounts of light alkylate and alkylate bottoms.

The next step is the sulfonation of dodecylbenzene into dodecylbenzene sulfonates. This compound comprises over 50% of all synthetic detergents in the United States.

The UOP Alkar Process unit is designed for the production of ethylbenzene from the ethylene present in Gas Recovery Unit off-gas and benzene from the Udex-Hydeal units. Use of the Alkar Process eliminates the requirement for a complicated gas concentration unit, thereby decreasing operating costs and initial capital investment. Although this process is fairly new, Universal has two commercial units in operation. The Alkar unit is followed by an ethylbenzene dehydrogenation unit based on using Shell 105 catalyst and styrene purification section. Universal has the technique and "know-how" to design the ethylbenzene dehydrogenation unit and purification section.

The quality of the styrene product would meet or exceed the following specifications:

Styrene - Polymer Grade

Purity	99.60% min. by wt.
Aldehydes, as benzaldehyde	0.020% max. " "
Peroxides, as hydrogen peroxide	0.010% " " "
Sulfur (as sulfur)	0.003% " " "
Chlorides (as chloride)	0.005% " " "
Polymer content	0.05% " " "
Solubility of polymer	Complete in benzene
Viscosity	0.87 centipoises max. at 25°C.
TBC (inhibitor)	10 ppm min. and 15 ppm max. for 30 days of 90°F.

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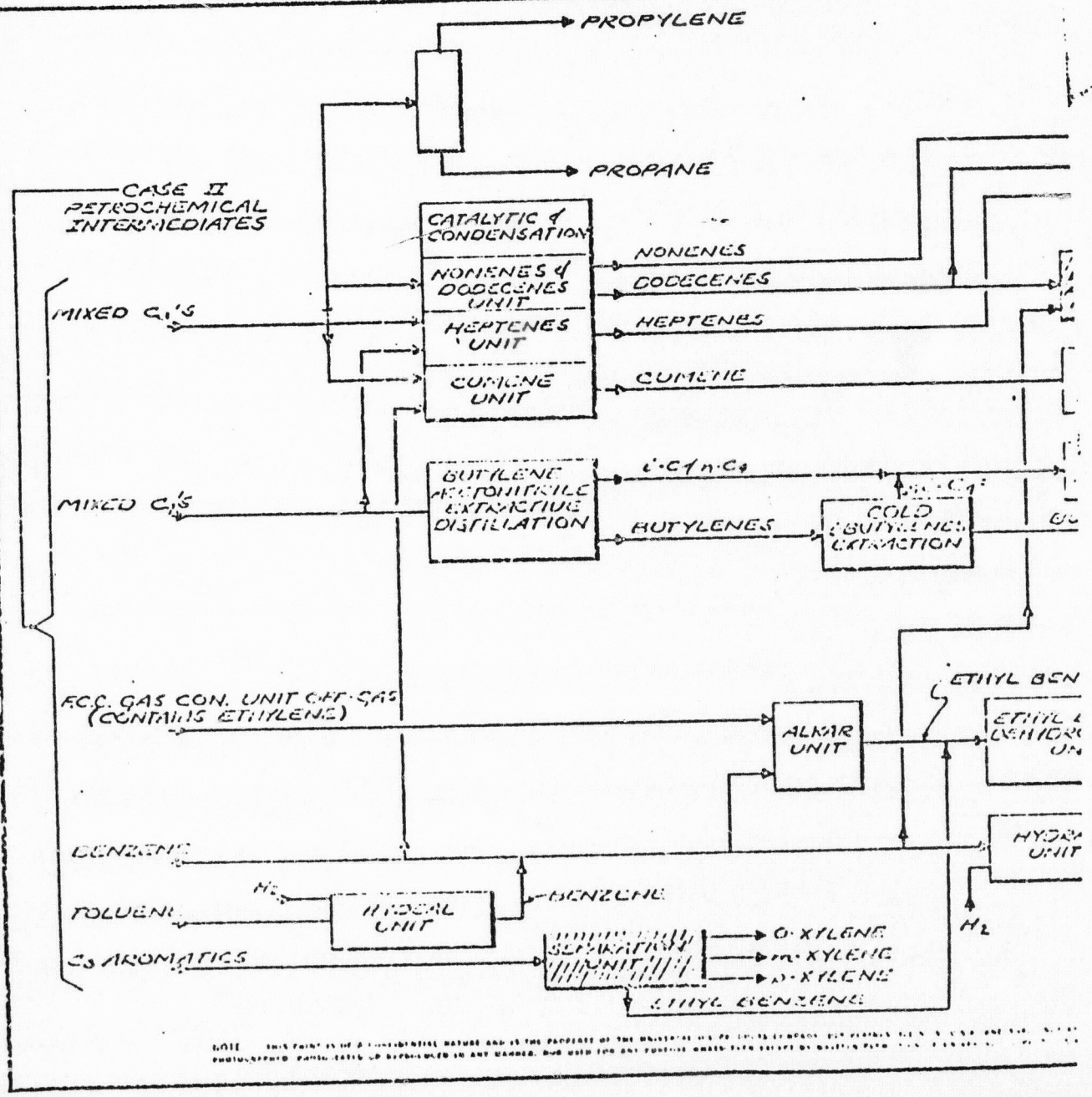

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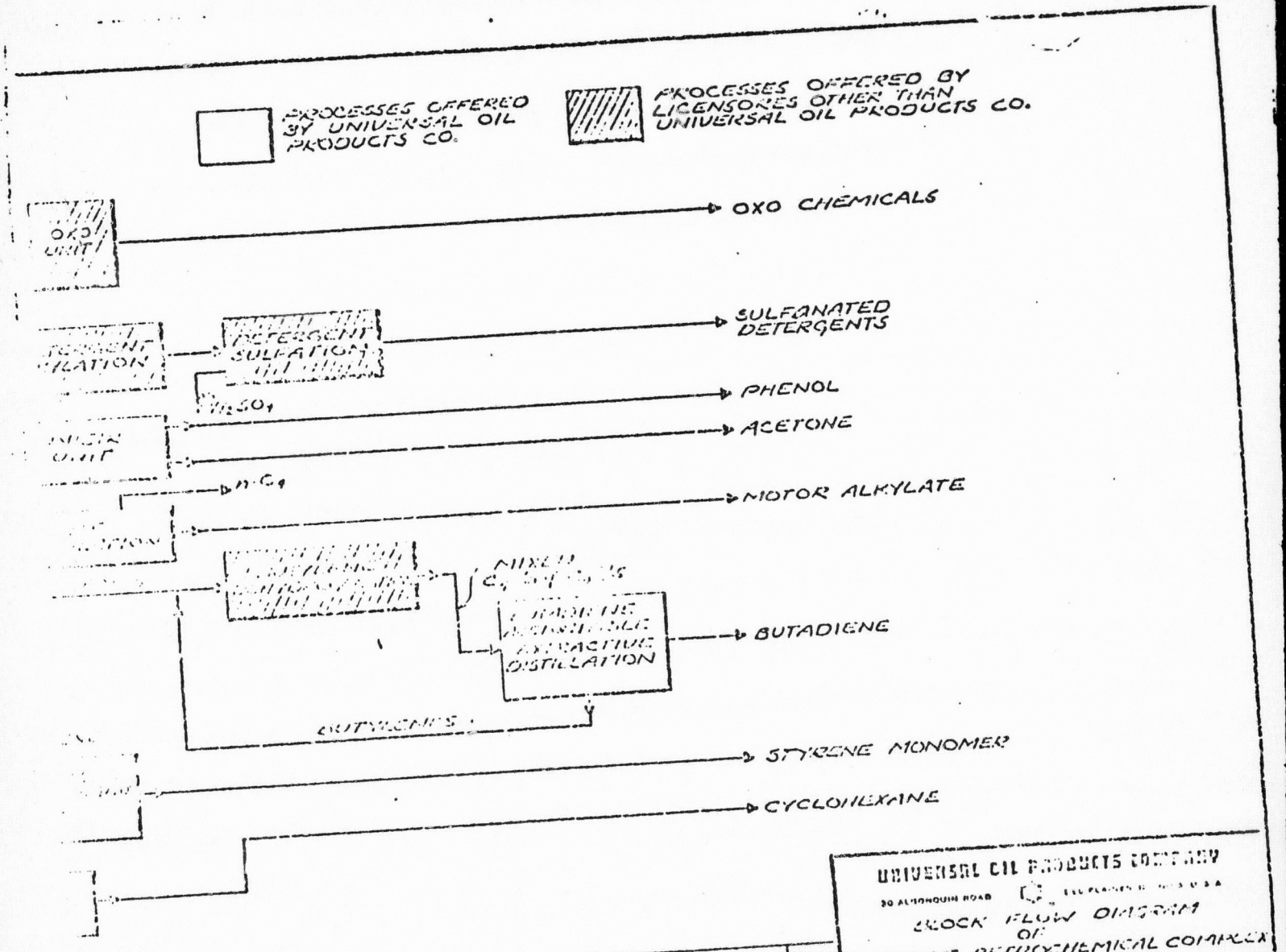

UNIVERSAL OIL PRODUCTS COMPANY
30 ALGONQUIN ROAD — DES PLAINES, ILLINOIS U.S.A.

BLOCK FLOW DIAGRAM OF POSSIBLE PETROCHEMICAL COMPLEX

DWG NO. 74761 -C- 0

DRN. W.A.S. CK'D. — APP'D. — DATE 10-11-61

REVISIONS

NO.	DATE	DESCRIPTION	BY	CK'D	APP'D

CHANGE

U.O.P.Co.

E121

VPO-2-225

J-8, Irizarry Memorandum, October 10, 1961

E 122

Conformed copy
of the text of J-8

October 10, 1961

Re: Petrochemical Plant

Today I met with Mr. John Gibbs, Jack Coan, Julius Flescher, Cliff Worthy, and Al Cella, who are the principals involved in this project.

The purpose of the meeting was to have further discussions on the preparation of the prospectus. Universal Oil of Chicago is preparing all production and cost estimates, therefore, the prospectus has not been completed.

Prospects expect to have the finished paper for the week of October 16th so that Mr. Diaz may take it to Pto. Rico. If agreeable to Mr. Diaz, they can visit with him while he is in Pto Rico, so that they may discuss their proposal with EDA officials. Prospects are willing to go at a moments notice.

J-9, Memorandum, Van Hyning to Durand, October 10, 1961

USA 33a - 475
(ED. 4-23-71)

E 123

EXHIBIT
U. S. DIST. COURT
S. D. OF N. Y.

J-9

FPI MI—9 24-75-50M-4417

October 26, 1961

MEMORANDUM

TO: Mr. Rafael Durand

FROM: Sam Van Hyning

SUBJECT: Petroquímica Puertorriqueña, Incorporated

Attached, as requested in your memorandum of October 23, is an evaluation of the proposed project of Petroquímica Puertorriqueña, Incorporated.

The Petroquímica Puertorriqueña document contains, in my opinion, a great many errors both of omission and commission. Evaluation of these in detail would have required preparation of a paper of excessive length. Should they wish to do so, I am prepared to discuss these matters in detail with representatives of Petroquímica Puertorriqueña.

The document is attached.

I am giving a copy of my memorandum to Díaz-Hernández and retaining a copy for myself.

SVH:cmq

Enclosure

432-Y-2
9-10-62
HARVEY B. KRAMER
REPORTER

J-10, Memorandum, Van Hyning to Durand, October 10, 1961

Mrs. Díaz-Hernández.

J-10

E 124

CONFIDENTIAL

October 26, 1961

MEMORANDUM

TO: Mr. Rafael Durand

FROM: Sam Von Kyning

SUBJECT: Petroquímica Puertorriqueña, Incorporated

The recent experience of Commonwealth Oil has demonstrated the profit potential of petroleum refining in Puerto Rico.

The earlier experience (1956-59) of CORCO also demonstrates the serious economic hazards which may confront a one plant company in this field.

Both of CORCO's experiences, the bad and the good, are relevant to the proposed project of Petroquímica Puertorriqueña, Incorporated (PPI). This is so because the basic economics of the project are dependent on the refining and marketing on the U. S. East Coast of good quality, standard, major petroleum products. Premium and regular grade gasolines, #2 fuel oil and #6 fuel oil account for 68% of total estimated value of production. If production of vacuum pitch for local sale is added, as seems appropriate, the proportion becomes 75%. (See Table XXIII, Section 6, Appendix D)

PPI proposes to compete in the U. S. market for sales of major petroleum products. PPI also proposes to compete in the U. S. and world markets for sales of basic petrochemical intermediates.

These are ambitious objectives. They would involve possible competition with the major U. S. oil companies. They would involve certain competition with major U. S. and European chemical companies.

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The first task of FPI is to determine what products they could market and to whom. I do not refer to sales possibilities. I refer to the negotiation of product sales contracts with varying terminal dates ranging from, say, 5 to 20 years.

Some of these sales contracts - specifically those covering gasoline and fuel oil production - should probably be linked to materials supply contracts - the so-called "back-to-back" type of arrangement.

I believe the FPI project to be economically feasible only if such contractual arrangements as those described above can be effected. Most of these contracts would have to be concluded with major oil companies. Parenthetically, given the size of the project I believe that it would be most imprudent for FPI to conclude a "back-to-back" agreement with a single major oil company.

The contracts I believe to be essential involve complex matters which are critical to economic success and the negotiations required are time consuming. Further, the major oil companies are both expert and "hard" bargainers. Negotiations on behalf of FPI could be wisely entrusted only to someone with extensive business experience in these matters.

What FPI should produce, the production processes to be used, and the raw materials to be purchased should be regarded as functions of what FPI concludes it can profitably sell. This does not mean that the choice of production processes and selection of raw materials are unimportant matters. Quite the reverse - the economic and technical questions involved are in many cases both important and complex. I will try to illustrate the sorts of considerations involved.

Should FPI plan to produce a single grade (octane rating) of gasoline or more than one grade? If a single grade of gasoline is to be produced, what

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octane rating should be aimed at? What octane ratings should be aimed at if more than one grade of gasoline is to be produced?

The immediately preceding questions involve variations in plant equipment investment decisions amounting to many millions of dollars. Additionally, the questions involve substantial variations in plant operating costs.

To illustrate the latter point immediately above, I note that the project has been costed on the basis of processing a crude oil known as Tia Juana Medium. The delivered price for this crude (from Venezuela) was estimated to be $2.35 per barrel (Incidentally, it is not clear whether this estimate includes the applicable U. S. import tax of 10.5¢/barrel. For the projected operation annual U. S. tax collections would exceed $3.6 million or about 20% of estimated net income during the period of Puerto Rican tax exemption). There are a number of less expensive crudes than Tia Juana Medium which might give the product yields of desired qualities. Considerations such as these must be costed through the third decimal place.

The problems which I have tried to illustrate can be evaluated only by a combination of engineering and economics talent.

Does PPI now command this sort of talent? My reading of the report is that PPI does not.

It is stated on p. 11 that the "detailed study" (Appendix D) was prepared by Universal Oil Products (UOP) in conjunction with Omega Management, Inc., consultants to PPI.

UOP's engineering reputation is good. I know nothing about the qualifications of Omega.

This study is not "detailed" in that it provides no basis for marketing and supply contract negotiations. It provides no basis for defining within reasonable limits the capital investment required to carry out the project.

E 127

It is my opinion that the estimated capital requirement of $94.3 million may understate the required investment, given what PPI proposes to do, by as much as 50%.

It should be appreciated that, while UOP is a competent engineering firm, UOP has definable interests which raise questions concerning the reliability of its evaluation of a project such as PPI. In addition to its engineering services UOP is also in the business of licensing its processes and selling materials such as catalysts and through its wholly owned subsidiary, PROCON, of constructing and maintaining plants such as that proposed by PPI.

I want to make it clear that what I have said and will say reflects unfavorably in no way on the corporate integrity of UOP. But it is a fact that the diversity of UOP's operations are such that its study should not be the basis for the contemplated investment of PPI. "Appendix D" is both an evaluation of the PPI project and a "sales pitch" for UOP. This duality of the PPI report should be appreciated.

If PPI is to proceed prudently with the project, independent counsel should be retained. By independent I mean a firm or a group of individuals which have no financial interest whatever in licensing processes, selling materials or constructing facilities for PPI.

The economics of the PPI project are more than questionable; they could prove to be disastrous.

The net income projected for the first year of operation exceeds $17 million. A prudent capital budget for a project as complex as that of PPI should make provision for a substantial loss during the first year of operations - a loss amounting to many millions of dollars. The capital budget should be based on achieving a break-even point probably no sooner than late in the second year of operations.

E 128

UOP based its cost calculations on operations at 95% of capacity from start-up of operations. A 95% rate of operation would be an imprudent budgeting basis for the life of the project; to postulate such a rate during the early years of the project would be to invite financial disaster for PPI.

PPI has not done its homework. The document is not, as described, a "detailed study". It is a most incomplete and, in my opinion, immature beginning.

When I say immature I refer, for example, to the Case I - Case II basic methodology of UOP.

UOP defines Case I as follows: "Producing normal petroleum fuels that will meet current and future markets as far as quality is concerned".

UOP defines Case II as follows: "Producing normal petroleum fuels that will meet current and future markets as far as quality is concerned plus the production of some of the normal petrochemicals that are commonly derived from petroleum sources".

PPI's proposed operation is Case II.

UOP prepared estimates of operating net income for each case (Appendix D, Section 3, Tables I and II).

In absolute amount estimated annual Case I net income is greater than Case II.

Estimated annual net earnings on equity range from 13% - 16% higher in Case I as compared with Case II.

The estimated higher absolute and relative earnings of Case I suggest that there may be something basically wrong in the economics of Case II. By this I mean that PPI's proposed petroleum refinery route to petrochemicals production in Puerto Rico may be unsound.

E 129-132

My overall conclusion is that it would probably take no less than two years of concentrated effort by FPI to develop a soundly-based project.

I would recommend that FPI be encouraged to proceed with the project for two reasons.

First, the following statement appears on p. 12 of the report: "Arrangements have been made with the firm of Hornblower and Weeks to be the prime underwriters for the company".

Second, Díaz-Hernández has told me that the consultants retained by FPI have expressed optimism about resolution of the prospective oil import quota problem.

EWH:smj

cc: Mr. J. Díaz-Hernández

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J-13, Van Hyning Memorandum, November 8, 1961

J-13

E 133

November 8, 1961

M E M O R A N D U M

TO: For the Record

FROM: Sam Van Wyning

SUBJECT: Meeting with J. P. Coan; Onega Management, Inc.

I met at his request with Mr. Coan on November 3, 1961. The meeting was arranged by Mr. Irvin Irmary of CCB.

My meeting with Coan lasted about two hours.

It is my opinion that Coan is both intelligent and able. My meeting with Coan convinced me that my memorandum of October 26 to Durand on the project of Petroquímica Puertorriqueña, Incorporated (PPI) was based on a fundamental misunderstanding.

The misunderstanding was the result of the statement in the PPI document that Appendix D of the document, prepared by Universal Oil Products (UOP), was a "detailed study".

Coan explained in our meeting that the UOP Appendix D was a "preliminary feasibility study"; not a "detailed study" on the basis of which action could be undertaken in the near future to start operations in Puerto Rico. The purpose of the UOP preliminary feasibility study was, as Coan explained to me, that of having a document which could be used as a basis for exploratory discussions with U. S. institutional investors.

The basic questions about the project raised in my memorandum of October 26 to Durand were, without exception, ones which Coan was well aware of prior to our meeting.

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FOR ID. 9-10-73
HARVEY B. KRAMER
REPORTER

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E-134

Our meeting therefore was concerned with necessary next steps for action; not with a detailed discussion of Appendix D.

I told Coen that the first step on our part was to clarify my interpretation of the PPI document. This I hope I have done above.

The second step on our part, as I told Coen, is to determine whether the PPI project will be backed by the Commonwealth Government, particularly in relation to the matter of the U.S. Oil Import Control Program. I told Coen that I was hopeful such support would be forthcoming but that he should understand that I could not speak for the Commonwealth in a matter of this sort.

Coen understood the point and then asked whether he should continue to prosecute the project Stateside or defer action until he had received positive assurance that the Commonwealth would support the project. My recommendation to Coen, with which he seemed to agree, was that he should continue to prosecute the project Stateside even though he had no authoritative assurance at this time of definitive Commonwealth backing for the project.

During our meeting Coen asked whether it might be desirable to discuss the PPI project with Durand. I stated the opinion that such a meeting would be premature particularly in view of the fact that my October 26 memorandum on the PPI project was based on a fundamental misunderstanding of the character and purpose of the PPI document which I had been asked to evaluate. Coen agreed that such a meeting would be premature.

Matters were left this way:

1. Coen will continue with his Stateside investigations.

2. I undertook to clarify my memorandum of October 26 to Durand - the basic purpose of this piece of paper.

E 135

3. The next step on the part of the Commonwealth is an expression of administrative interest, or lack of it, by the Commonwealth Government in the NPI project.

Addendum

Following our discussion of the NPI project Coen expressed an interest in PHILCO. He stated that he had a client who was interested in possible purchase of the plant.

I arranged for Coen to visit PHILCO which he did.

I informed him of Coen's interest in PHILCO.

Subsequently I telephoned Coen and he expressed considerable criticism about the physical facilities of PHILCO.

Throughout our discussion of PHILCO I emphasized to Coen that I was not competent to discuss PHILCO matters and that he should understand that I was acting as a "social secretary" for him in relation to his interest in PHILCO.

SVH:mg

cc: Messrs. R. Dowd
J. MacAllen
I. Irizarry

J-14, Letter from Van Hyning to Coan, November 8, 1961

COMMONWEALTH OF PUERTO RICO

Economic Development Adm.

San Juan, Puerto Rico

November

USA 33e - 475
(ED. 4-23-71)

E 136

EXHIBIT
U. S. DIST. COURT
S. D. OF N. Y.

J-14

FPI: MI—9-24-75-90M-4417

Mr. J. P. Coen
Omega Management, Inc.
230 Park Avenue
New York City 17, New York

Dear Mr. Coen:

I enclose a copy of the latest annual report of the Puerto Rico Water Resources Authority. You will recall that during our meeting electric power generation in Puerto Rico came up in relation to the bottled gas matter. I believe the report may also shed some light on the matter of vacuum pitch which we discussed.

Our meeting of last Friday was most helpful to me. I will take the first step this week in an effort to clarify the matter of Commonwealth Government support of the project. I lean in the direction that such support will be forthcoming but, as I told you in our meeting, several weeks will probably be required to determine this definitively.

Sincerely yours,

Sam Van Hyning

Sam Van Hyning
Economic Consultant
Office of Economic Research

Enclosure

J-14
432-AI
9-10-73

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J-15, Letter from Coan to Van Hyning, November 8, 1961

J-15

CABLE ADDRESS: OMEGAM

E 137

OMEGA MANAGEMENT

INCORPORATED

230 PARK AVENUE • NEW YORK 17, N. Y.

LEXINGTON 2-2929

November 8, 1961

DUPLICATE ORIGINAL

Mr. Sam J. Van Hyning
Economic Consultant
Economic Development Administration
Santurce, Puerto Rico

Dear Mr. Van Hyning:

Thank you very much for your courtesy during my visit to your office last Friday. It was a pleasure to discuss in confidence with you some further details concerning banking, insurance company relationships, marketing, and organization planning. Because the petrochemical industry is not only highly competitive but also highly profitable, I think you can understand our reluctance to reveal all negotiations that are presently underway.

The reasons for our choice of Universal Oil Products for preliminary feasibility and profitability analyses are obvious because of their standing and reputation in financial circles. We are, however, attempting to secure the services of a prominent European firm which has done similar work for major national and international refineries. It is our planned objective to make this the most modern and flexible petrochemical operation in the world. Final plans for the installation, however, cannot be made until we have negotiated all of the long term back-to-back and end use requirements contracts. We are negotiating these contracts primarily on the basis of inducing additional industries to locate plants and facilities in Puerto Rico.

If we are successful in building an industrial complex around Petroquimica Puertorriquena, Incorporated, we will set another example for the world of the effective use of private capital, public resources, modern management and modern technology in the

J-15
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FOR RE 9-10-73
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Mr. Sam J. Van Hyning November 8, 1961

development of internal financial stability.

In accordance with the conclusions of our discussion, we are proceeding with our parts of the project as agreed with you. I assume that we will receive some notice concerning the Commonwealth's support of this project, and look forward to your assistance in the future.

Thank you also for arranging my visit to the meat packing installation. This is one of the most modern I have seen. It should be possible to interest any number of qualified operators in the United States, provided adequate sources and markets can be developed. We are pursuing this problem with the appropriate people here in New York.

As we agreed, if any additional information or expert technical advice is needed concerning the basic project, we can bring the appropriate people to you on short notice. Finally, let me express my appreciation for the transportation and hotel arrangements that were made so quickly.

Very truly yours,

JPC:ks J. P. Coan

J-16, Letter from Coan to Diaz-Hernandez, November 24, 1961

CABLE ADDRESS: OMEGA

OMEGA MANAGEMENT
INCORPORATED
230 PARK AVENUE • NEW YORK 17, N. Y.
LEXINGTON 2-2929

J-16 E 139

November 24, 1961

Mr. Jesus Diaz Hernandez
Executive Director
Economic Development Administration
Commonwealth of Puerto Rico
666 Fifth Avenue
New York, New York

Dear Sir:

About six weeks ago we presented to your organization, on behalf of Petroquimica Puertorriquena, Incorporated, a preliminary prospectus concerning a third refinery operation in Puerto Rico to be owned primarily by residents of the Commonwealth, if possible.

Since our presentation to you, we have met in Puerto Rico with Mr. Van Hyning to clarify certain questions regarding the proposed company. In a letter to us dated November 8, 1961 Mr. Van Hyning indicated that we should be advised in a few weeks concerning the Commonwealth's position with respect to this project.

Since our presentation, we have met with major chemical companies, including Celanese, du Pont, Union Carbide, one division of Monsanto, and Imperial Chemical Company concerning their petrochemical feedstock requirements. In addition, we have negotiated an understanding with Texaco, Incorporated to supply up to 40,000 barrels of crude oil per day, and a reciprocal contract from the same company to purchase the petroleum products other than petrochemicals produced therefrom.

In all of these negotiations there has been substantial interest in the proposed project. The location has not been revealed in order to avoid possible competitive repercussions.

DEF. EX 432-AM
FOR ID 9-10-73
HARVEY D. KRAMER
REGISTER

Mr. Jesus Diaz Hernandez

November 24, 1961

We are at the stage in our negotiations with these companies on behalf of Petroquimica Puertorriquena, Incorporated where it will be advisable for us to indicate not only the location of the plant, but also possibilities for them to participate with us locally in the project. As you know, the economic importance of this project is such that, properly organized, it can be used to provide a basis for the establishment of many other industries. In this regard, if the Commonwealth agrees to support our work, we would like to assist your Administration in inducing other companies to locate plants and train personnel in their operation within Puerto Rico.

Because the next phases of our work will involve substantial investment in organization commitments, feasibility studies, and contractual arrangements, we would appreciate your advice concerning the Commonwealth's official position with respect to this project.

Very truly yours,

J. P. Coan

JPC:ks

J-17, Memorandum Coan to Diaz-Hernandez, November 24, 1961

1-17

November 24, 1961

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A PROPOSED DRAFT

To: Petroquimica Puertorriquena, Inc.
C/O Omega Management, Inc.
230 Park Avenue
New York 17, New York

From: Mr. Durand

We have examined the preliminary prospectus of Petroquimica Puertorriquena, Incorporated and evaluated the principals of the company. Our Office of Economic Research is satisfied with the quality of the proposed project and the benefits that might accrue therefrom to Puerto Rico.

We understand that the United States Department of Interior is favorably disposed to the establishment of a third refinery whose principal production would be petrochemical feedstocks derived from crude oil. The purpose of this refinery is to provide materials which are not now available in the Caribbean and Central and South America and will serve as a basis for inducing American and international companies to locate plants and operations in this area to serve these markets.

Because we have discussed the need for petrochemicals as a core industry to advance the economic growth of the Commonwealth, and because the proponents of this company propose to allow maximum local participation in its ownership, we herewith give this project our complete support, including all necessary assistance with respect to site selection, permission to build, and other appropriate matters.

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DEF. EX. 432 - AL
FOR ID: 9-10-73
HARVEY B. KRAMER
REPORTER

J-18, Letter, Chapman to Gibbs, December 11, 1961

J-18

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[illegible] MCGUIRE AND FRIEDMAN

[illegible]
WASHINGTON 6, D. C.
[illegible]

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

[illegible]
[illegible]
CAMPBELL, WALKER & HOOVER
[illegible]
DENVER 2, COLORADO

December 11, 1961

Mr. John H. Gibbs,
President,
Petroquimica Puertorriquena, Inc.,
1422-27 Lewis Tower Building,
Philadelphia 2, Pennsylvania.

DEF. DEPT. DAY 463
WHT. DATE 1-21-746
DEF ASSTN. REPRODUCTION SERVICE

Dear Mr. Gibbs:

This will confirm our recent conversations concerning the retention of my firm as counsel for your corporation, Petroquimica Puertorriquena, Inc.

I understand that Petroquimica Puertorriquena, Inc., is a corporation now in its formative stages, which proposes to establish a petrochemical industry in Puerto Rico. As counsel for your corporation, my firm would provide legal advice and guidance with particular reference to relationships with the various departments and agencies of the United States Government. We would also be responsible for performing other legal services as required.

Our fee for the above mentioned services will be as follows:

Six thousand dollars ($6,000.00) payable upon execution of this contract. Thereafter $1,000.00 per month payable monthly in advance, beginning January 1, 1962. If in any one month the time expended on behalf of Petroquimica Puertorriquena exceeds the sum of $1,000.00 on a time charge basis, computed at the regular rates of my office, we will bill you for this excess. These rates are $50.00 an hour for my time, $35.00 an hour for other partners' time and $17.50 an hour for the time of junior associates. In addition, my firm will be reimbursed for all actual out of pocket disbursements covering such matters as long distance telephone calls, travel, reproduction of documents, etc.

If it should become necessary for us to associate other counsel in other jurisdictions or for particular specialized undertakings, we will discuss the engagement of such counsel with you in advance and

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agree both as to the particular counsel and as to the fee involved.

It is agreed that any special engineering, economic or other technical consultants will be retained by you directly under separate agreement.

It is also understood that within a reasonable time after the execution of this agreement, we will execute a supplementary agreement providing for a stock participation by this firm in the corporation on mutually satisfactory terms to be worked out between us.

This agreement shall remain in effect for a primary term ending December 31, 1962 and thereafter shall be automatically renewed for additional periods of one year unless, at least thirty (30) days prior to the termination of the date of the contract, either party hereto informs the other, in writing, of a desire to terminate.

If the above correctly sets forth the agreement between us please so indicate in the space provided below and return one executed copy of this agreement to me.

I am looking forward to a pleasant and fruitful association with you and your group.

Sincerely yours,

Oscar L. Chapman.

ACCEPTED:

_____

John H. Gibbs, President,
Petroquimica Puertorriquena, Inc.

DATE: _____

J-19, Letter, EDA to PPI, c/o Omega Management, Inc.
December 12, 1961

J-19

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December 12, 1961

Petroquímica Puertorriqueña, Inc.
c/o Omega Management, Inc.
230 Park Avenue
New York 17, New York

Gentlemen:

We have examined the preliminary feasibility study of Petroquímica Puertorriqueña, Inc. We are satisfied that consummation of the project would result in substantial and continuing benefits to the economy of Puerto Rico.

Present regulations of the U.S. Oil Import Control Program as they pertain to Puerto Rico preclude establishment of a third refinery utilizing imported oils. We have discussed this matter informally with officials of the U.S. Department of the Interior and we are hopeful, on the basis of those conversations, that the regulations will be amended during the next few months so as to make a third refinery eligible to utilize imported oils.

Because petrochemical feedstocks production would tend to redress Puerto Rico's paucity of indigenous industrial raw materials, we wish to assure you of our full support for the project assuming, as we hope, that it in no way conflicts with the basic objectives of the U.S. Oil Import Control Program.

Sincerely yours,

Rafael Durand
Administrator

DEF. ID: 432-AP
FOR ID: 9-10-73
HARVEY B. KRAMER
REPORTER

J-20, Letter, Brown to Chapman, December 22, 1961

USA 33a - 476
(ED. 4-28-71)

E 145
EXHIBIT
U. S. DIST. COURT
S. D. OF N. Y.
J-20

FPI-NI—9-24-75-50M-4417

BRUCE K. BROWN
1410 OIL AND GAS BUILDING
NEW ORLEANS 12, LOUISIANA

December 22, 1961

Mr. Oscar L. Chapman
Chapman, Wolfsohn and Friedman
Pennsylvania Bldg.
13 and Pennsylvania Ave., N. W.
Washington 5, D. C.

Dear Oscar:

Herewith are two copies of a twelve-page evaluation of the Puerto Rican project. I think it is quite appropriate that Messrs. Gibbs, Coan, Worthy, et al should receive copies of the report but I have not sent them copies. I have two reasons for such conservatism: first, I want to have the benefit of your counsel because I well appreciate that after you have read this you may propose some changes; second, my contacts with the promotional group have been so limited to date that I would prefer to "listen to them talk a little more" on the chance that it might change some of my opinions.

I shall devote the rest of this letter to an informal recital of some of the steps that will have to be taken to get this project off the ground.

First of all, as I told you over the telephone, I believe a high level contact with the Commonwealth Government is the first requisite. It may be that some of the officials of the Economic Development Administration have already had some definitive contacts with the American chemical manufacturers such--for example--as DuPont. Indeed they may actually have a definitive list of prospective purchasers of petrochemical raw materials. I hope they have. However, such a contact is no substitute for getting some preliminary broad assurance that the Commonwealth will go to bat with the U. S. authorities in support of the project. Assuming that that can be accomplished, I think that the relative order of "next steps" is about as follows:

A really high grade, experienced, executive-negotiator, familiar with both petroleum refining and petrochemicals, needs to be put on the job in firming up the plan outlined in the U. O. P. brochure. U. O. P. should not be relied upon to decide whether, for example,

...ill make pitch or will make fuel oil. The final engineering of ... needs to be tailored to the fit of the customers, and by ... the chemical customers rather than the oil customers. ... individual I refer to will have to find out what DuPont, et al ... want to buy and work with Universal to modify the refining plan ... the correct products come out in the correct volumes.

While about 90% of the products of the refinery will be ...inary refinery products that have to be sold to oil companies ... nevertheless true, in my opinion, that it is the other 10% that we ... to worry about first.

If a real need for petrochemical raw materials can be developed and if real commitments can be obtained from the chemical companies, all of the other steps--obtaining the quota, securing financing for the project, and making deals to buy crude and sell refinery products--will fall in line fairly easily.

It should be noted that there is a distinct possibility that all of this promotional work, no matter how successfully it may be accomplished, would only clear the way for a competitive group to seize the prize. I have heard that Admiral Nick Carter is promoting another refinery in Puerto Rico and already has a site located. It is distinctly possible that the Pontico refinery has hopes of securing additional import quotas, expanding its refining equipment and itself serving as a "core" refinery. While Pontico is ostensibly operated by independent refiners (the Fischers of Pontiac Refining Company), I understand that the investment is held by the Gulf Pension Plan. Gulf might move into the situation. Incidentally, I may observe that if one of the large chemical companies such as Monsanto had the drive and courage to undertake such a project, they could probably do just as good a job of selling the petroleum products to major companies as anyone else.

For your information, some companies owning Venezuelan crude and U. S. markets have been quite vexed at being left out of the CORCO deal. Naturally, these companies are logical prospects for relation with the new project. From the political standpoint--both in San Juan and in Washington--it would be of advantage to make a place for smaller oil companies in the new project.

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Returning now to the all important question--the obtaining of a license to import crude oil--I know the people in your office are experts on present regulations and I am sure that they will agree that there is simply no provision for the type of allotment that we have in mind here. We need an allotment promised for the future in order to permit a guarantee to investors who are asked to advance money to build a project in Puerto Rico which would be valueless without an assured source of raw materials. I have been puzzling as to how such advance assurance could be obtained and I don't have any good answer.

Under such circumstances it may be just as well to "shoot for the moon." A moon shot in this case would consist of getting the Puerto Rican Legislature to pass some sort of resolution or law reciting that the establishment of a new core refinery in Puerto Rico was essential to the advancement of the economy of the Commonwealth, that Petrochimquimica Puertorriquena, Inc. was the chosen instrument and that all officials of the Commonwealth were directed to take all necessary steps to achieve the objective!

With best wishes, I am,

Sincerely,

Bruce

BKB:ag

Encl.

J-21, Memorandum, Brown to Chapman, December 22, 1961

12/13/72

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PRELIMINARY EVALUATION OF THE PETROQUIMICA PUERTORRIQUENA, INC. PROJECT

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PRELIMINARY EVALUATION OF THE PETROCHEMIQUICA PUERTORRIQUENA, INC. PROJECT

The project, herein referred to as the "new project" cannot proceed unless it is assured of the right to import foreign crude oil into Puerto Rico. Unless such reasonable prior assurance is obtained the project cannot be financed. Even if financing is potentially available a prudent lender would not advance funds unless the project was further secured by contractual commitments of third parties to sell crude and buy back the products.

This report sets forth the basic facts concerning the new project, explains the logistics and economics of the CORCO refinery (which will be the principal competitor), comments on the economics of the new project as revealed in the U. O. P. brochure and discusses the crude oil import regulations applicable in the premises.

THE NEW PROJECT AS PRESENTED

The new project as outlined in the U. O. P. brochure is essentially a 100,000 b/d petroleum refinery producing:

4,100 b/d	Aromatic petrochemicals
5,225 b/d	"Raffinate"--low octane naphtha suitable for production of ethylene
8,050 b/d	Liquefied petroleum gas
13,445 b/d	"Pitch" (which would have to be sold locally); and
68,385 b/d	Of "Normal petroleum refinery products" which could move by tanker

These "normal products" are:

Gasoline	26,200 b/d
#2 Heating oil	19,870
#6 "Bunkers"	13,445

Messrs. Coan and Gibbs advised me that they had assurances from some major companies (including Texaco) that if an import quota was obtained for the project they would undertake to:

(a) sell Venezuelan crude oil to the project; and

(b) buy back products.

Possible Modification of Product Yields from New Project

"Pitch"--13,445 b/d

Pitch solidifies at 200°F. and can be transported only in a steam heated line for a short distance. It would take a very large industrial user to consume 13,445 b/d. (The power plant near the CORCO refinery uses only 4,000 b/d.) From the standpoint of promoting the new project, it would be a master stroke to persuade the Commonwealth of Puerto Rico government (or some very large industry) to promise to buy and use it for power generation.

Failing this, the yield structure would have to be changed so that additional #6 fuel oil (bunkers) would be produced instead of pitch. The effect would be to slightly reduce the predicted over-all realization.

"Raffinate"--5,225 b/d

The U.O.P. brochure indicates that this low octane naphtha could be used to produce ethylene--presumably by the steam cracking process. (The writer is not certain whether the cost of the special equipment was included in Case II estimate of $94,305,200.) At 30% yield this would support an ethylene plant to produce about 150,000,000 lbs. per year, which is a relatively small plant by mainland standards although more than one "standard-size" poly ethylene or ethylene glycol plant would be required to consume the product. Butadiene is a large by-product of this operation.

Liquefied Petroleum Gas (Propane and Butane)--8,050 b/d

The U.O.P. brochure indicates that the new project would have what is really an abnormally high yield of L.P.G. Some might be consumed locally for fuel, although the dominant independent marketer on the island sells only about 300 b/d.

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Effort should be made to divert some or all of the L. P. G. into petrochemical usage on the island. If an ethylene market in excess of 150,000,000 lbs. per year can be developed, some propane could be cracked to ethylene.

DISCUSSION OF CORCO--PRINCIPAL COMPETITOR

In a certain sense the new project could be regarded as a "second CORCO" (Commonwealth Oil Refining Company). CORCO has a crude input capacity of 75,000/ b/d and it sells petrochemical raw materials to Carbide and is constructing a plant to produce aromatic petrochemicals.

The new project would not be violently competitive with CORCO if major companies did relieve it of the "normal petroleum products" at favorable prices. (The real competitors of the new project would be the mainland refineries which would have to cut back crude runs to the extent that gasoline and heating oil from the project was moved to the mainland.) However, competition would become very real if (a) either company had products in surplus over firm sales contracts and/or (b) if import restrictions were lifted entirely.

CORCO's Logistics

Because of the similarities between CORCO and the new project, it appears that a review of the CORCO situation in 1957 (as revealed in SEC filings) is of interest.

Under Term Contracts Expiring from 1962 to 1966
(Some have been renewed and expanded since 1957)

	Daily Barrels of Crude To Be Sold	Daily Barrels of All Products To Be Purchased
Esso	18,000	6,566
Texaco	10,000	6,535
Socony	5,000	5,000
Shell (Asiatic)	4,400	4,400
Sun	6,000	9,000
Gulf	12,000	12,000
	55,400	
New England Petroleum Co.		7,150 (#6 Oil)
Union Carbide - Caribe		1,667 (Light products for petrochemicals)
Puerto Rican Water Resources Authority		4,000 Pitch
		56,318

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Since 1957 CORCO crude run has increased, its current (1961) import quota being 67,134 b/d. It is understood that 1962 quota will increase by about 4,000 b/d.

While CORCO used several different Venezuelan crudes (and some Middle Eastern crudes) in its early years, it later settled down to running one selected "blended crude" of 24.5° gravity and all of its crude suppliers arrange, by exchanges, to supply this same crude. Shell calls it "Tigre Leone"; Esso calls it "Tigre"; and Texaco calls it "Oretipano." Because it is less than 25° gravity, the duty is only 5-1/2¢/bbl. instead of 11¢. It may be noted that the Venezuelan government has ruled Puerto Rico within its "red line area"; meaning that crude produced from "new" (post 1945) Venezuelan concessions must pay an 8% ad valorem tax if refined in Puerto Rico. CORCO suppliers get around this by "trading" crudes.

ECONOMICS OF THE NEW PROJECT

The writer has, to date, expended only about an hour "hitting the high spots" of the U.O.P. brochure; nevertheless some tentative comments on the economics of the project are indicated. The computations of profitability were based on certain assumed crude oil costs and assumed product realizations. The estimated cost of crude oil, delivered, seemed realistic and the product prices were intimated to be current Puerto Rican prices for petroleum products and probable fair values for the petrochemical raw materials.

The writer has no basis for criticizing the prices used in the U.O.P analysis but he believes that the petroleum product prices (at least the light products) were those intended to be realized by sale to a buyer that would transport the products to the mainland for resale in the domestic market. To the extent that it was necessary (and possible) to sell in export markets, the net prices on light products sold would be lower than those used in the computations.

> CORCO, subject to exceptions too complicated and intricate to explain here, has maintained the posture of buying Venezuelan crude at approximately the posted price (thus pleasing both the major oil crude vendors and the Venezuelan government) and selling the products back to largely the same major companies at "Platt's low for Gulf Coast cargo." Actually most large volumes have been moving at prices below Platt's low but the majors have been

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content to pay the posted price because (a) they were selling their Venezuelan crude at an artificially high posted price and (b) the actual cost of transportation to the East Coast (in U. S. flag tankers) is about the same from Puerto Rico as it is from the Gulf Coast.

Differentiation between the U. S. market and the foreign market is vital to a comprehension of the economics of the new project. Let us approach the point by analyzing the position of a prospective major oil crude supplier such as Esso. Esso has more crude oil in Venezuela than it knows what to do with. It has excess refining capacity in Venezuela (and at Aruba) which it could easily use to refine the extra increment of crude. What it lacks is a legal way to bring the products into the United States. (The same is true of Texaco at Trinidad.)

Next let us consider a highly hypothetical situation--assume that the refinery envisaged in the U. O. P. brochure was suddenly created on the shores of Puerto Rico and that, simultaneously, the United States restrictions on crude oil imports were abandoned. In that event the companies owning crude oil in Venezuela and refineries there and elsewhere would still be willing to sell crude oil to the new refinery (and probably at much lower prices) but these companies would be willing to buy products only at prices lower (considering transportation) than their own refining costs in depreciated plants.

APPLICATION OF CRUDE OIL IMPORTS RESTRICTIONS TO PUERTO RICAN REFINERIES

Both CORCO and the Gulf-controlled Pontico (Caribe) refineries were in existence when the restrictions were promulgated. While all of the below comments are hearsay, the writer believes them reliable.

The subcabinet committee that prepared Proclamation 3279 of March 10, 1959 recognized that Puerto Rico would have to be an exception to the general rules for two reasons:

1. for comity with the Commonwealth and to protect its new industries; and

2. it would be economically infeasible to supply the refineries with--say--90% domestic and 10% foreign crude (as on the mainland) because

(a) Venezuelan crude was only four hundred miles away and the refineries had been built to run on it, and (b) the transportation cost (particularly in U. S. flag tankers) of moving crude from the Gulf Coast to Puerto Rico and then moving the products back to the mainland would be prohibitive.

For these reasons the proclamation and the subsequent regulations enunciated the policy (see Proclamation, Section 2 (d)) that the maximum level shall be the 1958 level

> "as determined by the Secretary . . . consonant with the purposes of this proclamation or such higher or lower levels as . . . are required to meet increases . . . in local demand or demand for export to foreign areas."

It is my understanding that while Puerto Rico is part of the United States and there is no legal bar to the movement of any quantity of its petroleum products to the mainland, there is nevertheless a practical political bar to unlimited product movements. This arises (I understand) from the practical fact that the import authorities have extracted promises both from the refiner and from the Commonwealth government that only a certain percentage of the refined products will be moved to the mainland and that the rest will be used locally or exported.

It is difficult for the two refineries now in Puerto Rico to build up profitable export business because world prices, generally, are below U. S. prices.

Any company desiring to build a refinery in Puerto Rico could, I believe, secure the cooperation of the Commonwealth authorities and the oil import authorities; provided it brought the crude in, duty-free, in bond and exported the products. Any company (such as Esso, Gulf, Texaco, etc.) owning foreign crude and controlling foreign product markets could do this. (None do because there is already an excess of foreign refining capacity.) Such a refinery, once in operation, would be entitled to some small import quota; measured by the growth in Puerto Rican demand and shared with the others.

However, no company would be justified in doing this anyway unless it had controlled foreign markets. Superior Oil Company, for example, has plenty of Venezuelan crude but no refining or marketing organization.

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THE ARGUMENT FOR THE NEW PROJECT

Present Status of the Puerto Rican Petrochemical Industry

The fact that industries utilizing petrochemical raw materials are willing to locate in Puerto Rico is well illustrated by the petrochemical complex created at Ponce by Union Carbide Caribe to draw materials from the refinery operated there by Commonwealth Oil Refining Company. Starting with a plant producing ethylene oxide and ethylene glycol, Carbide Caribe has now under construction a $20,000,000 plant to produce 110,000,000 pounds per year of polyethylene. Commonwealth has itself announced a plant to produce naphthalene (again from refinery streams) and Stepan Chemical Company intends to produce phthalic anhydride from the naphthalene. It would appear that eventually the petrochemical plants served by the Ponce refinery will represent an investment equal to or exceeding the $60,000,000 cost of the basic refinery.

It should be noted that these petrochemical operations, important as they are, can utilize as raw material only a small portion of the crude oil passing through the refinery. In order to support these operations the refinery must produce and sell ordinary petroleum products--gasoline, kerosene, diesel fuel, household heating oil (#2 oil), "bunkers" (residual fuel oil) and pitch. The Puerto Rican Water Resources Authority buys the pitch and some "bunkers" for power generation. A considerable but minor part of the other products is utilized in the Commonwealth and some "bunkers" are exported. Nevertheless the principal part of the refined petroleum products is (and must be) transported to the mainland of the United States for consumption.

Further Advancement of the Puerto Rican Petrochemical Industry

It is obviously in the best interest of the Commonwealth of Puerto Rico to attract more petrochemical plants to the island but it appears equally obvious that the complex at Ponce will soon mature. Thus expansion will come to a grinding halt unless more petrochemical raw materials can be made available to prospective users. To do this will require the construction and operation of more basic petroleum refining equipment. Unlike the continental United States, Puerto Rico has no supply of natural gas available.

Comparison of Petrochemical Industry on the Mainland with Puerto Rico

The petrochemical industry in the United States is burgeoning. 1961 production is estimated at 65 billion pounds and investment

approximates between $6 billion and $7 billion; about 60% of the assets of the entire chemical industry. M. W. Kellogg Company has estimated that the annual investment in petrochemical facilities now exceeds that made for orthodox petroleum refining and that this trend will continue and become more pronounced. Yet only 2-3% of continental United States production of petroleum and natural gas is so consumed.

To a great extent natural gas and light hydrocarbon streams are alternate sources of petrochemical raw materials and a very considerable proportion of the tonnage of petrochemicals produced in the continental United States is derived from natural gas. To a considerable extent the two sources are interchangeable.

The installations of Petroleum Chemicals, Inc. at Lake Charles, Louisiana are a case in point. PCI built plants to produce ammonia from hydrogen and ethylene delivered to it by pipeline in the form of gases from two adjacent refineries. The ammonia is sold as such. The ethylene is converted to ethylene oxide, ethylene glycol and polyethylene--essentially the same type of operation as that conducted at Ponce. The ammonia plant and the ethylene plant were originally built to such a size as to consume all of the raw material available from the supporting refineries. But later expansion was easy. To produce more ammonia than can be produced from the refinery hydrogen stream, PCI will simply make the needed hydrogen from natural gas. To produce more ethylene than can be produced from the refinery "ethane stream," PCI simply buys ethane separated from an abundant supply of nearby natural gas. Because of the absence of natural gas, such an expansion in Puerto Rico could be accomplished only by generating more such "streams" by processing imported crude oil.

Puerto Rican Petrochemical Industry Advance
Must Await Another Core Refinery

To advance the Puerto Rican chemical industry further, it is necessary to expand petroleum refining operations on the island. Until refinery hydrocarbon "streams" are available from a new "core" plant, there will be no additional raw material available for use.*

The building of a new core refinery would take about eighteen months starting from the time engineering plans are completed and financing arranged. The financing of the core refinery would require evidence of commitment from other parties to purchase at least a major portion of the output; both normal petroleum refined products and petrochemical raw materials. It should be specially noted that these two commitments, while equally necessary to the new project, are quite different in nature.

*A minor exception to this is that refinery streams for petrochemical raw materials may be available to a limited extent from the small Pontico refinery near San Juan.

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The commitment by oil companies to sell crude to the project and buy refined petroleum products from it does not require substantial new investment by them. It requires, mainly, a commitment to revise the over-all logistics of each oil company to divert foreign crude oil (presumably Venezuelan crude) to the project and to absorb the products in its marketing system. Because of the plethora of crude oil and refineries in the Eastern Hemisphere, in the Caribbean and in Northern South America, it is evident that such products as cannot be used on the island must flow to North America and largely to the East Coast of the United States.

The commitments to take petrochemical raw materials are different. As a practical matter they must be used in plants built on the island, near the core refinery. These commitments cannot be fulfilled except by building millions of dollars of new facilities to be ready at the same time or shortly after the core refinery commences operation.

Need for a License to Import Crude Oil to Supply the New Project

Before any of the above negotiations can be effected, it is necessary to establish that crude petroleum will be available for use at the core refinery. Under the proclamation of March 10, 1959, "Adjusting and Regulating Imports of Crude Oil and Its Principal Products into the United States," there was a finding that

> "The Commonwealth of Puerto Rico largely depends on imported crude oil . . . and that . . . the adjustment of imports . . . should permit imports into Puerto Rico adequate for the purposes of local consumption, export to foreign areas; and limited shipment of finished products to the continental United States."

For reasons previously demonstrated, the petrochemical industry of the Commonwealth cannot be substantially expanded unless the crude oil necessary to the expansion is permitted to be brought to the island and, presumably, to the new project under discussion. Further, it appears to be clearly in the interest of the Commonwealth Government to make the necessary arrangements so this can be done; commencing--say--two years from now and continuing; so long as there are any restrictions on imports of crude oil. It is not necessary to establish that the crude oil must be imported or that some of the refined products will flow to the mainland because the proclamation recognized the special logistics situation that prevails in the case of the island.

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Opposition to Be Expected

An expansion of the flow of foreign crude oil into Puerto Rico from--say--90,000 bbls. per day to 190,000 bbls. per day will doubtless be opposed by the mainland petroleum industry producers and refiners. Those advocating a lessened flow of crude oil into the United States may argue that increase of 100,000 bbls. per day to Puerto Rico is just as bad as a flow to Philadelphia; particularly when the products therefrom are shipped to the mainland. Those companies owning foreign crude oil and moving it to their own East Coast refineries to supply their own markets may argue that--so long as import restrictions prevail--the net effect of increasing the importation of crude oil to the new project in Puerto Rico is to (a) reduce their quotas and (b) transfer the refining project from their refineries to the new project.

In all probability no frontal argument will be made against expansion of the Puerto Rican petrochemical industry as such.

Answers to Opposition

It appears, however, that the Commonwealth could produce sound answers to such objections.

As to the petroleum products shipped to the United States, the following figures are of interest:

The population of the mainland United States is 178,500,000 and its refinery capacity is 10,000,000 bbls. per day or .056 daily barrels per capita.

The population of Puerto Rico is 2,350,000 and the capacity of its two present refineries is 88,000 bbls. per day (restricted somewhat by quotas) or .033 daily barrels per capita.

Drawing a closer geographical comparison, the East Coast area (Census Bureau's New England, Middle Atlantic and South Atlantic States) has a population of 70,650,000. In 1960 it used 1,400,000 bbls. per day of gasoline. Based on a 45% yield of gasoline from crude oil, the East Coast uses the output of about 3,110,000 bbls. per day of refining capacity (1,530,000 bbls. per day located on the East Coast and 1,580,000 bbls. per day elsewhere; mostly Gulf Coast). On this basis, the East Coast area has available about .044 daily barrels of refining capacity per capita.

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Of course, it could still be argued that Puerto Rico should not refine more crude oil than it can use on the island but there are many arguments contra:

1. There is no governmental regulation extant that prevents the building of refineries on the mainland and there is plenty of crude oil available there. Why discriminate against business in the Commonwealth?

2. The argument that Puerto Rico does need a refinery because its citizens cannot purchase and use all of the products from the two refineries already there is similar to an argument that it shouldn't encourage the building of a pants factory because its citizens can't buy all of the pants.

3. The practical effect of opposing the granting of a license to import crude oil to the new project is to stifle the growth of a petrochemical industry in the Commonwealth. (No alternate raw material--i. e. --natural gas--is available on the island.) The stimulation of petrochemical industry in Puerto Rico is just as important as the stimulation of other industry.

4. Unless a license is granted, the Commonwealth will be put at a specific disadvantage as compared to the mainland because its growth in the petrochemical field will be stymied by a regulation that does not in any way retard competition on the mainland. There is plenty of domestic crude oil and domestic natural gas available on the mainland to support any conceivable expansion of petrochemical manufacturing. If at some future date--say--five years from now--it is determined that restriction of crude oil imports is no longer necessary for national security and, hence, is lifted; then the Commonwealth petrochemical industry will have been "frozen" for five years during which the mainland industry will have advanced.

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The Language of the Proclamation Justifies the Promise of a License to Import to Support an Expanded Petrochemical Industry

The finding of the fourth Whereas of the proclamation of March 10, 1959 was that the regulatory system should permit imports into Puerto Rico adequate for:

> "The purposes of local consumption, export to foreign areas, and limited shipment of finished products to the United States."

The argument for a license for the new project should be founded on the first purpose--i. e.--"the purposes of local consumption."

At the time of issuance of the proclamation, the petrochemical industry on the mainland consumed only about 2% of the daily usage of petroleum and natural gas and it is unlikely to consume more than 3% in the foreseeable future. Because the formulators of the policy were concerned mainly with the fuel economy, it is not strange that petrochemical raw materials (mostly gases or highly volatile hydrocarbons and, hence, not easily "importable") were not specifically taken in account. On the other hand, the petrochemical industry is a large one and a growing one. (The Department of Interior is currently at work through its National Petroleum Council to determine the make-up, products, size and raw material requirements of the industry.)

The existence of the new project and the willingness of chemical companies to buy the petrochemical raw materials from its proposed refining operation for local consumption is in itself proof that the economic development of the Commonwealth will be retarded if the materials are not made available for local consumption.

Bruce K. Brown
1410 Oil and Gas Building
New Orleans 12, La.

December 22, 1961

J-23, UOP Site Survey, March 1962

DX-416-.6 1411

J-23

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UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD DES PLAINES, ILLINOIS U.S.A.

March 16, 1962

Mr. J. P. Coan
President
Omega Management Inc.
230 Park Avenue
New York 17, New York

Re: Site Investigation Trip to San Juan for Omega Management Inc.

Dear Mr. Coan:

We are enclosing five (5) copies of subject report covering the preliminary site survey developed from our recent trip with you during the last part of February.

We believe this report will act as an aid in the possible location of the petroleum/petrochemical complex in the Commonwealth of Puerto Rico, as contemplated being installed within the next year or so. The information so developed in this report is basic and there are some items yet undefined due to the need for further study and investigation. This work will be needed to be done at a later date when the refinery scheme becomes more concrete in nature.

The contents of this report I believe in the most part to be self-explanatory. However, after you have had an opportunity to inspect this report, we look forward to a meeting at your convenience to receive your comments and clarify any points which may require explanation.

Very truly yours,

UNIVERSAL OIL PRODUCTS CO.

George E. Shelton

G. E. Shelton

E. J. Swain

E. J. Swain

EJS:dm

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SITE INVESTIGATION TRIP TO SAN JUAN

FOR OMEGA MANAGEMENT INC.

UOP-2-115

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SITE INVESTIGATION TRIP TO SAN JUAN
FOR OMEGA MANAGEMENT INC.

UOP-2-115

Site Investigation Trip to San Juan
for Omega Management Inc.

On February 20, 1962, Mr. G. E. Shelton and E. J. Swain of UOP arrived at San Juan, Puerto Rico, meeting Mr. J. P. Coan, President of Omega Management Inc., New York City, and Mr. S. J. Van Hyning, Economic Consultant to the Economic Development Administration of the Commonwealth of Puerto Rico, with the purpose of developing certain information on the proposed refinery/petrochemical site and other relative information to the proposed refinery project. This meeting involved looking over pertinent maps of Puerto Rico published by U.S. Geological Survey, U. S. Coast Guard and Geodetic Survey, Departmento de lo Interior Puerto Rico, the Puerto Rico Industrial Development Co., plus one book, the "U.S. Coast Pilot Book No. 5 - the Gulf Coast, Puerto Rico and Virgin Islands", and a detailed report entitled "Investigation of On-Shore and Off-Shore Physical Features of Potential Port Sites, Puerto Rico", by Dr. Ta Liang, consultant, Ithaca, New York. Dr. Liang's report was prepared for the Puerto Rico Ports Authority, San Juan, Puerto Rico. The information UOP gathered from the maps, pilot's book and Dr. Liang's report was most helpful in planning an aerial survey of the island.

On February 21, 1962, the above party of four made an extensive aerial tour of the coast line of Puerto Rico to review the best possible location for the future petroleum/petrochemical refinery. The aerial trip was supplemented by a motor car trip from the Mayaguez airport through the city of Mayaguez and back around the shoreline of Bahia de Anasco. The primary object of the trip was to obtain data locally, such as maps, weather, meteorology information, availability of local facilities and labor, and other pertinent information that would facilitate a general recommendation for the petroleum complex site. As this is a preliminary site investigation, there are many items that are as yet indefinite and would need further study and investigation. It is the purpose of this report to be only general in nature, to make recommendations for several locations that would serve as a site.

The following are comments and general findings on the various locations viewed from the aerial and motor trip:

The north and east coasts of the island were ruled out due to lack of suitable unoccupied port sites. San Juan is already the site of one petroleum refinery and Roosevelt Roads is a U. S. Naval & Missile base. Furthermore, the prevailing winds are northeasterly.

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Five port sites were selected for consideration on the east, south, and west coasts of the island, namely, Puerto Yabucoa, Bahia de Jobos (Central Aguirre), Bahia de Guayanilla, Bahia de Guanica, and Bahia de Anasco. Each of these prospective sites will be discussed in detail.

Puerto Yabucoa

Playa de Guayanes is a small town serving as a port for Yabucoa located five miles inland. Yabucoa has a population of 5,300, general stores, two small hotels, a hospital, and telephone and telegraph facilities. San Juan is located 90 miles northwest by highway. The sugar industry furnishes business for the town and port. Only vessels of 21 foot draft or less can enter the harbor and the passage is difficult. Vessels navigate in and out of the harbor during daylight hours only. Strong northeasterly afternoon breezes make two anchors on a vessel necessary. Deep water is 1700 yards off shore and unprotected from the weather. The bay is two miles wide with numerous reefs and sunken rocks. An extended area of level, firm ground runs back from the bay to Yabucoa.

Bahia de Jobos

The harbor of Bahia de Jobos consists of an anchorage 5 miles long and varying in width from ½ mile to 1 mile. However, only 50% of this area is of a depth of 23 feet or greater. The bottom is soft and ships anchors would drag during a hurricane. The land surrounding this harbor is low-lying and swampy. However, farther inland there are extended areas of level, firm ground.

The town of Central Aguirre located on Bahia de Jobos has a population of 3,000, with telephone and telegraph services. The sugar industry has a pier here 1300 feet long. Vessels drawing up to 23 feet can berth on either side of it.

Bahia de Guayanilla

Bahia de Guayanilla, located 7½ miles west of Ponce, is the largest hurricane harbor, and one of the best in Puerto Rico. It can accommodate vessels of 40 feet draft or less. Commonwealth Oil Refining Company and Texas Company have wharves in this bay.

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The town of Guayanilla with a population of 2,000 to 3,000 is located 2 miles inland and has no urban facilities. The limited amount of level ground between the bay and the town is rather low-lying for refinery construction. Punta Verraco, a point of land ½ mile wide and 1½ miles long extending eastward outside the bay has no level land areas suitable for a refinery site without considerable land-leveling or benching and in time the area might prove to be rather cramped. Furthermore, a state forest is located just west of the bay and as a recreational resort might cause public relations problems for a petroleum refinery at some future date. The city of Ponce is located 12 miles to the east.

Bahia de Guanica

Bahia de Guanicais a good, natural harbor but too small and shallow for the berthing of oil tankers. Two small towns are located on the bay, Ensenada and Guanica. Each has a population of about 4,000 to 5,000. Telephone and telegraph services are available at both towns.

Bahia de Anasco

Bahia de Anasco is on the west coast of the island facing Mona Passage. Deep water runs in close to shore. In one area the water is 48 feet deep within 300 yards of the shore line. (This 48 feet depth area should be checked by sounding to confirm the hydrographic map.) On shore, extended areas of firm, level ground are available for choosing a refinery site, also electrical transmission lines run thru this area. Judging from the lay of land sufficient fresh water should be available from water wells. However, in case additional water should be necessary, water reservoirs could be constructed without great difficulty in the hilly country just north of Bahia de Anasco.

The town of Anasco with a population of 3,500 is located 4 miles to the east of the bay and the city of Mayaguez with a population of 50,000 to 60,000 is located 12 miles to the south of the bay. Mayaguez has a shipping terminal that can accommodate vessels of 30 feet draft. This shipping terminal has a wharf 1200 feet long equipped with a shed 800 feet long by 60 feet wide plus various pieces of modern equipment for the mechanical handling of cargo.

Mayaguez has a number of stores and shops, two good hotels, telephone and telegraph service, an airport serviced by scheduled air line flights, plus a branch of the University of Puerto Rico. San Juan is 118 miles away by coastal highway. On Punta Higuero, 10 miles north of the bay, is a nuclear reactor in the construction stage.

After deliberating over the advantages and disadvantages of the five above mentioned possible sites for a petroleum refinery, we believe that the Anasco Bay area should be chosen for the following reasons:

(1) A large area of firm, level land from which to choose a refinery site without pre-empting established settled areas.

(2) A bay which can be without difficulty fitted out with oil tanker berthing facilities.

(3) Likelihood of a good supply of fresh water.

(4) A petroleum refinery located here would be close to two centers of population - the town of Anasco and the city of Mayaguez. With these two centers of population nearby a ready-made labor market is at hand - already housed.

(5) The fact that there is a branch of the University of Puerto Rico in Mayaguez might be of interest to permanent refinery employees.

(6) Mayaguez has a suitable port for unloading construction material and refinery equipment with only a short haul to the refinery site.

(7) A petroleum refinery located on Bahia de Anasco would be in a favorable position to fuel ships sailing the Mona Passage.

(8) The area around Mayaguez and Bahia de Anasco has been by-passed by the rising tide of Puerto Rico economic development which is so evident at San Juan and Ponce.

(9) This area is serviced by a regularly scheduled air line as well as chartered flights.

(10) The area has a modern highway traversing it, backed up by a substantial secondary road system.

(11) Electrical power transmission lines run thru this area with the power generating stations not too far away.

The only disadvantages that a petroleum refinery located near Bahia de Anasco would have is the fact that oil tankers serving the refinery would not have the protection of a suitable harbor like Bahia de Guayanilla.

A petroleum refinery located on Bahia de Guayanilla would have many of the same advantages listed for Bahia de Anasco, namely:

(1) It would be located close to a large center of population - the city of Ponce with a population of 100,000 to 110,000.

(2) Ponce has good port facilities.

(3) The area is served by a regularly scheduled air line as well as chartered flights.

(4) The area has a modern highway system.

(5) Electrical power generating stations are in the area.

(6) The Bahia de Guayanilla is an excellent harbor.

The disadvantages of locating a petroleum refinery in the Bahia de Guayanilla would be two: -

(1) The smaller area of firm, level ground from which to choose a refinery site.

(2) The question of a good supply of fresh water must be investigated.

After reviewing the advantages and disadvantages of these two areas - Bahia de Anasco and Bahia de Guayanilla, it is apparent that the choice of a site hinges on whether oil tanker berthing facilities at Bahia de Anasco would cost a great deal more than similar facilities at Bahia de Guayanilla and, also, whether the Commonwealth of Puerto Rico wishes a further concentration of industry around Ponce or give the economy in the area around Bahia de Anasco and the city of Mayaguez a lift.

J-24, UOP Refinery Feasibility Study, April 1962

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

APRIL, 1962

PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

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PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

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Drawing No. 76823-C-Rev.0
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Drawing No. 76761-C-Rev.0
Block Flow Diagram of Possible Petrochemical Complex

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PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

SECTION 1

INTRODUCTION

The primary purpose of this study is to act as an aid in the investigation of the general economics of a proposed 60,000 barrels per day (BPD) refinery processing a typical Venezuelan crude to produce normal petroleum fuels as well as the maximum feasible quantity of petrochemical raw materials and intermediates.

There are many process schemes that are available in the petroleum refining industry, which are mainly dependent upon the product markets the organization wishes to enter. The schemes presented in this report may be considered typical and are as follows:

Producing normal petroleum fuels that will meet current and future markets as far as quality is concerned plus the production of some of the normal petrochemicals that are commonly derived from petroleum sources.

Included in this report are tables showing the operating cost and expenses, profitabilities and yield estimates of the various process units utilized in the two schemes. Also, a general description of the processes with their flow diagrams are present.

To also aid in determining a process scheme when producing petrochemical intermediates, a section is included describing possible processes that will utilize these intermediates.

The attached process and economic study is largely based on information developed and processed by Universal in regards to Puerto Rico. However, while the study has been prepared by us in accordance with established engineering practice and is useful in evaluating the proposed refinery and operations, it does not constitute any warranty, representation or guarantee with respect thereto. It is understood that Universal Oil Products Company's name shall not be used in connection with any prospectus or securities registration statement to be filed by your company with any governmental agency.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

SECTION 2

BASIC CONSIDERATIONS

In performing the study certain assumptions were made and are listed in this section under various categories.

Crude Oil Supply and Price

In reviewing the crude oils that are available from Venezuela, several crudes were found to be typical and in sufficient production quantity that could supply the needs of the proposed refinery. For this study, a Venezuelan crude known as Tia Juana Medium crude was used. This crude is believed to be available for long term contracts. A laid-in price at the refinery for this crude was taken at $2.35/bbl.

Product Market and Prices

The quantity of petroleum products produced from a 60,000 BSD refinery located in Puerto Rico were assumed to be, to a great extent, exported out of the country to the east coast markets of the United States. Current output of the two refineries presently in Puerto Rico far outdistances current and future demands of petroleum fuel for local market consumption. A relatively high percentage of the current refinery outputs are exported to the east coast markets. The assumption was also made with petrochemical raw materials and intermediates although joint ventures or future petrochemical expansion could limit the export of petrochemicals so derived.

Therefore, all petroleum fuel products and petrochemical material were assumed to have sufficient export and local markets to absorb all production quantities. It is suggested that an organization contemplating entering in the refining or petrochemical industry should make a close examination to determine their market position as to the type of products and quantities they wish to handle under long term manufacturing contracts.

Product prices used in the study are believed to be those generally applicable to those received at the refinery gates in the Puerto Rico area. They are a combination of local market prices and export market prices.

DX-420-D-aa 2/6/73

Product Price	$/Bbl.	¢/Gal.
Premium Gasoline	4.979	11.86
Regular Gasoline	4.628	11.02
No. 1 Fuel Oil	3.896	9.28
No. 2 Fuel Oil	3.430	8.17
No. 6 Fuel Oil	2.151	5.12
Pitch	1.800	4.29
L.P.G. (C_3)	2.964	7.06
Mixed C_3's	2.964	7.06
Mixed C_4's	2.964	7.06
Benzene	10.500	25.00
Toluene	7.560	18.00
C_8 Aromatics	6.300	15.00
Raffinate	4.041	9.62
Naphthalene, ¢/#	—	(5.0)

Operating Costs

In constructing the operating costs for a Puerto Rican refinery various costs such as labor, utilities, fringe benefits, operating personnel requirements as effected by local labor efficiency, and other associated costs were taken into general consideration based on knowledge from current similar operations present in Puerto Rico.

Estimated Process and Offsites Investment

The estimated capital investment for process and offsites facilities of the proposed schemes are based on curve estimates of current day costs of similar equipment erected at a U.S. Gulf Coast location. These cost estimates are subject to precise design definition; however, they are sufficiently accurate for planning purposes. There may be some question arise as to the differences that construction costs would be lower in Puerto Rico than the United States Gulf Coast. It is believed that all major items of equipment will be shipped in from the U.S. which will increase material costs somewhat over Gulf Coast prices. Labor prices are lower in Puerto Rico but considering the available pool of skilled labor in Puerto Rico to construct a 60,000 BSD refinery is quite small. A construction firm would need to import continentals to supply the skill job classifications. This labor cost as well as somewhat higher material costs should just about equalize capital investment in Puerto Rico to that at the U.S. Gulf Coast location.

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Yield Estimates

The exactness of the yield estimates shown throughout are adequate for the purposes of this report, but will require confirmation for precise process designs. Depending on the final settlement of the type of crude to process and type of products to be produced will determine the process scheme as well as more precise yield.

In order to provide the highest reasonable degree of accuracy in the estimates made through this report, the respective product distribution and erected cost are based upon processes licensed by Universal Oil Products Company. Specific processes of the same general type will experience somewhat different product distribution and erected cost. Because of our greater familiarity with the specific capability and cost factors of these processes as compared with competing processes, the estimates shown in this report are based on processes as follows:

Specific UOP Process Used as Basis for Evaluation
Fluid Catalytic Cracking Process Unit (F.C.C.)
UOP Catalytic Condensation Process Unit
UOP 'HF' Alkylation Process Unit
UOP Platforming Process Unit
Unifining Process Unit
Udex Process Unit
Hydeal Process Unit
UOP Merox Process Unit

Other non-licensed processes and offsite facilities are the type that Universal has had many years of commercial experience in the design and economic evaluation.

Site Investigation Trip to San Juan

On February 20, 1962, a preliminary site survey was conducted in Puerto Rico.

The following are comments and general findings on the various locations viewed from the aerial and motor trip:

The north and east coasts of the island were ruled out due to lack of suitable unoccupied port sites. San Juan is already the site of one petroleum refinery and Roosevelt Roads is a U.S. Naval & Missile Base. Furthermore, the prevailing winds are northeasterly.

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Bahia de Jobos

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The town of Guayanilla with a population of 2,000 to 3,000 is located two miles inland and has no urban facilities. The limited amount of level ground between the bay and the town is rather low-lying for refinery construction. Punta Verraco, a point of land 1/2 mile wide and 1-1/2 miles long extending eastward outside the bay has no level land areas suitable for a refinery site without considerably land-leveling or benching and in time the area might prove to be rather cramped. Furthermore, a state forest is located just west of the bay and as a recreational resort might cause public relations problems for a petroleum refinery at some future date. The city of Ponce is located 12 miles to the east.

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After deliberating over the advantages and disadvantages of the five above-mentioned possible sites for a petroleum refinery, we believe that the Anasco Bay area should be chosen for the following reasons:

(1) A large area of firm, level land from which to choose a refinery site without pre-empting established settled areas.

(2) A bay which can be without difficulty fitted out with oil tanker berthing facilities.

(3) Likelihood of a good supply of fresh water.

(4) A petroleum refinery located here would be close to two centers of population - the town of Anasco and the city of Mayaguez. With these two centers of population nearby a ready-made labor market is at hand - already housed.

(5) The fact that there is a branch of the University of Puerto Rico in Mayaguez might be of interest to permanent refinery employees.

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A petroleum refinery located on Bahia de Guayanilla would have many of the same advantages listed for Bahia de Anasco, namely:

(1) It would be located close to a large center of population - the city of Ponce with a population of 100,000 to 110,000.

(2) Ponce has good port facilities.

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After reviewing the advantages and disadvantages of these two areas - Bahia de Anasco and Bahia de Guayanilla - it is apparent that the choice of a site hinges on whether oil tanker berthing facilities at Bahia de Anasco would cost a great deal more than similar facilities at Bahia de Guayanilla and, also, whether the Commonwealth of Puerto Rico wishes a further concentration of industry around Ponce or give the economy in the area around Bahia de Anasco and the city of Mayaguez a lift.

On Stream Time

345 stream days per year have been used giving a 95% on stream efficiency. For example, 60,000 barrels per stream day (BSD) of crude charge to the crude unit is 57,000 barrels per calendar day (BCD). The other 20 days left in the year are for process maintenance.

Utilities

Electricity - Assume purchase of power from Puerto Rico Water Resources Authority.

Refinery Fuel - Refinery fuel gases produced from the various processing units with the supplement requirements made up by using visbreaker pitch. Gaseous fuel deficiency would be made up by the pitch, which would be used preferably in the atmospheric and vacuum distillation and visbreaking unit.

Water Supply - A potable water supply for refinery sanitary facilities and steam boiler make-up is assumed to be obtained from fresh water wells. Process cooling water will be sea water.

Steam Generating Facilities - Sufficient refinery steam generating facilities have been provided even in the cases where a process having waste heat-steam generation facilities may be upset.

Inventories - Crude and Products

Since crude and product inventories tie up a large dollar value in a refinery of 60,000 BSD capacity, a strict control and review should set policy on this matter. It is assumed that crude inventory is twenty days for this size refinery. A leasing of super tankers to handle crude delivery should be investigated. A round trip for crude delivery by super tanker is considered about 5-8 days between Venezuela and Puerto Rico.

The majority of the products produced are considered for exporting to the east coast of the United States. A reasonable inventory was taken into account for the products considering time necessary for a round trip and quantity of material available for shipment by T-2 tankers.

A thorough investigation of the pitch and LPG local markets will aid in determining the economics of supplementary refinery fuel gas with either pitch or LPG. Large LPG inventories can be costly from the storage standpoint.

Acquirement of Total Capital Investment

The total capital investment was assumed to be raised by the following means as stipulated by Omega Management Incorporated.

- 20% of capital investment will be equity capital
- 80% of capital investment will be convertible sinking funds debentures, 6% interest rate, 20-year term.

In determining the economics of the two cases, it was assumed that the yearly sinking fund payment is 1/20 of the total debentures. Yearly payment is made at the end of the year and from income after taxes. The 6% interest rate on the sinking fund debentures is one the year beginning unpaid balance of debentures.

Equity capital is in the form of common stock.

Income and Property Tax

During the first ten years of the proposed cases no corporate income or property tax is due. The rates used after that are based on the current rates as developed by the Department of the Treasury, Commonwealth of Puerto Rico and listed in "What You Should Know About Taxes in Puerto Rico," 1961 edition.

Depreciation Rates and Items

Depreciation rates and items used in the economics of the two cases are considered normal for a typical refinery. However, there are always extremes from the average for various reasons and is determined by company policy, within government regulations.

Process and offsites facilities and starting capital are considered the depreciable items. Depreciation rate is as follows:

1. Process capital - straight line on 15 years life - 10% salvage value
2. Offsites capital - straight line on 20 years life - 10% salvage value
3. Startup capital - straight line on 10 years life.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

SECTION 3

SUMMARY

On the basis of the premises outlined under the Introduction, Section 1, and Basic Considerations, Section 2, it is estimated that a 60,000 BSD refinery can be built in Puerto Rico at a cost of $57 million, including working capital and start-up expenses depending upon the processing scheme selected.

Capital not included in the above investment costs are those for the acquisition of land, and for the necessary dock facilities. These two cost items could raise the above capital investments several million dollars. However, until a more definite plan is formulated, these items are beyond the scope of this report.

Tabulated in Table I is a summary of the investment, payout and net operating profit for the respective cases under consideration. Based upon the net equity earnings generated over a 20-year period as shown in the tables, it would seem that this scheme would warrant serious consideration. However, the author believes at this time that economics presented are slightly overly optimistic for several reasons which are as follows:

1. Total capital investment shown is understated for reasons previously mentioned.

2. Product yields shown from both cases are assumed to be consumed either on the local markets or export market. Again as mentioned in Section 2 of this report, an organization contemplating entering the refining or petrochemical industry should make a close examination to determine their market position as to the type of products and quantities they wish to handle under long-term manufacturing contracts.

The two schemes presented indicated a fairly good return of common equity. Moreover, if there is more than just a good return on investment in consideration such as a possible stimulus to the Puerto Rico economy, this is beyond the scope of the report. Perhaps a little philosophy at this point may

aid in the investigation of the general economics of a proposed 60,000 BPD refinery. If it is desired that the product output of this refinery be more petrochemical raw materials and intermediates rather than petroleum fuels, the following alternatives may be taken:

Process modification to this scheme.

1. The addition of a low pressure coker that will use virgin vacuum bottoms as feedstock to produce petroleum coke and lighter distillate materials that could be consumed as feedstocks in the processes shown in Case I. This would lower the yield of pitch and No. 6 fuel oil otherwise produced as well as increasing the amounts of aromatic and olefin materials.

2. The addition of an Isomax Process Unit that could convert light and heavy distillates (including vacuum gas oil) into naphthas that could increase the output of the aromatic chemicals. This would lower the output of middle distillates and perhaps heavy distillates depending on the process schemes.

3. The addition of ethylene cracking processing could increase the olefin compounds that are perhaps desired. The feedstocks that may be used for ethylene cracking could be many of the normal products available from this scheme.

Feedstock modification to this scheme.

1. Rather than running the total 60,000 BPD in the form of crude oil, there is the possibility of replacing a portion of the crude with purchased naphtha. This material is available from Venezuela in quantities that could deem a serious investigation into increasing the output of aromatic chemicals.

In conclusion, this report is believed to act as an aid in the investigation of the general economics of a proposed refinery to be located in Puerto Rico. Moreover, it points out areas for further investigation depending upon the corporation's policies of entering into petroleum or petrochemical manufacture.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE I

ESTIMATED NET OPERATING INCOME

Year	Product Value	Charge Value	Gross Profit	Operating Expenses	Net Profit	Sinking Fund Debent.	Debent. Interest 6%	Income Before Deprec.	Depreciation	Balance Before Taxes	Income Taxes	Income After Taxes	Earnings on Equity Net	Earnings on Equity Less
1	$72,579.0	$48,645.0	$23,934.0	$9,683.8	$14,250.2	$2,315.6	$2,778.7	$11,471.5	$2,574.0	$ 8,897.5	-	$ 8,897.5	$6,511.8	$ 9,189.9
2	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	2,639.8	11,610.4	2,574.0	9,036.4	-	9,036.4	6,720.8	9,378.9
3	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	2,500.8	11,749.4	2,574.0	9,175.4	-	9,175.4	6,829.8	9,487.9
4	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	2,361.9	11,888.3	2,574.0	9,314.3	-	9,314.3	6,938.7	9,596.7
5	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	2,223.0	12,027.2	2,574.0	9,453.2	-	9,453.2	7,047.6	9,705.6
6	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	2,084.0	12,166.2	2,574.0	9,592.2	-	9,592.2	7,156.5	9,814.6
7	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	1,945.1	12,305.1	2,574.0	9,731.1	-	9,731.1	7,265.5	9,923.5
8	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	1,806.2	12,444.0	2,574.0	9,870.0	-	9,870.0	7,374.4	10,032.4
9	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	1,667.2	12,583.0	2,574.0	10,009.0	-	10,009.0	7,483.3	10,141.4
10	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	1,528.3	12,721.9	2,574.0	10,147.9	-	10,147.9	7,592.3	10,250.3
11	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	1,389.4	12,860.8	2,574.0	10,286.8	$3,787.1	6,499.7	4,859.1	7,517.0
12	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	1,250.4	12,999.8	2,574.0	10,425.8	3,834.2	6,591.6	4,926.0	7,584.0
13	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	1,111.5	13,138.7	2,574.0	10,564.7	3,881.3	6,683.4	4,992.9	7,650.9
14	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	972.6	13,277.6	2,574.0	10,703.6	3,928.4	6,775.2	5,059.7	7,717.7
15	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	833.6	13,416.6	2,574.0	10,842.6	3,975.5	6,867.1	5,126.5	7,784.5
16	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	694.7	13,555.5	900.0	12,655.5	4,022.6	8,632.9	5,193.4	7,851.4
17	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	555.7	13,694.5	900.0	12,794.5	4,069.7	8,724.8	5,260.2	7,918.2
18	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	416.8	13,833.4	900.0	12,933.4	4,116.8	8,816.6	5,327.0	7,985.0
19	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	277.9	13,972.3	900.0	13,072.3	4,163.9	8,908.4	5,393.8	8,051.8
20	72,579.0	48,645.0	23,934.0	9,683.8	14,250.2	2,315.6	138.9	14,111.3	900.0	13,211.3	4,211.0	9,000.3	5,460.6	8,118.6

Notes:

(a) Total capital investment $57,889,600
20% Equity Capital $11,577,920
80% Convertible
Sinking Fund Debentures, 6% interest, 20 years $46,311,680

(b) Yearly Sinking Fund, 1/20 of $46,311,680 = $2,315,584 paid at the end of each year out of income after taxes.

(c) Debenture interest, 6% on the unpaid debentures.

(d) Earnings on equity: Net income after payment of the yearly sinking fund
Gross income after payment of the yearly sinking fund plus depreciation

(e) Depreciable items: Process and offsites facilities and startup capital

(f) Depreciation rate: Process Capital - straight line on 15 years life - 10% salvage value
Offsite Capital - straight line on 20 years life - 10% salvage value
Depreciable capital - straight line on 10 years life

(g) Income Tax: No income tax due for first ten years. Thereafter, tax rate is 36.75% of taxable net income less $10,100

(h) All numbers in thousands.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

SECTION 4

OPERATING COSTS AND CAPITAL INVESTMENTS

In this section are presented in detail the information covering the operating costs and capital investments. Constructing the following tables of operating costs and capital investments certain assumptions were used as outlined in Section 2, Basic Considerations, of this report.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE II

ESTIMATED DIRECT OPERATING COST

	$/SD
1. Refinery Labor	
Including Maintenance, Safety, Warehouse and Utilities	6,863
2. Tetraethyl Lead	
Cost @ 0.25¢/cc T.E.L.	1,650
3. Maintenance - Offsites and Process	5,650
4. Laboratory & Misc. Supplies	275
5. Catalyst	
(a) F.C.C. catalyst @ 0.3 lb/bbl. @ 18¢/lb.	768
(b) Platforming catalyst	
1. B-T-X Platformer - 50 bbl./lb.	405
2. Hvy. Nap. Platformer - 55 bbl./lb. @ $3.45/lb. net replacement	540
(c) Hydrobon catalyst	
1. Naphtha Unifiners @ 200 bbl/lb. @ $1.60/lb.	116
2. Distillate Unifiner @ 200 bbl/lb. @ $1.05/lb.	62
(d) Hydeal catalyst @ 5 bbl./lb. @ $1.00/lb.	248
(e) Merox catalyst	
F.C.C. Gasoline Merox	7
C_3/C_4 Merox	5
Total Catalyst	2,154
6. Chemicals and Inhibitor	
(a) Gasoline additives	
1. Sweetening agent 3 lbs./1,000 bbls. @ $1.00/#	47
2. Corrosion inhibitor, 6 lbs./1,000 bbls. @ 39¢/#	37
3. Metal inhibitor 1 lb./1,000 bbls. @ $1.00/#	16
(b) Corrosion inhibitor, ammonia, lime amine, etc. @ 30¢/lb.	51
(c) Water treating, $1.50 per day/1,000 gpm circulated	87

TABLE II (Cont'd)

ESTIMATED DIRECT OPERATING COST

	$/SD
(d) Glycol @ 0.1 lb. glycol/bbl. of charge @ 17¢/lb.	82
(e) Clay @ 0.5 lb. clay/bbl. of aromatics @ $30/ton	15
Total Chemicals	335
7. Royalties (Running Basis)	
(a) F.C.C. @ 4¢/bbl. charge	569
(b) Platforming @ 5.5¢/bbl. charge	800
(c) Unifining	
Naphtha Unifining - Waived	--
Distillate Unifining @ 1.5¢/bbl. charge	178
(d) Hydeal @ 5% of naphthalene sale value	514
and 0.5¢/gal. benzene	73
(e) Udex @ $250,000 amortized over 10 years	
(f) Merox	
F.C.C. Gasoline @ 0.5¢/bbl. charge	37
C_3/C_4 @ 0.5¢/bbl.	21
Total Royalties	2,195
8. Insurance	
Estimated @ 2.0% of process, offsites and inventories	2,730
9. Utilities	
Electricity @ 1.0¢/KWH	3,860
Fuel*	945
Cooling water @ 0.9/1,000 gals. once-through	582
Steam @ 55.0¢/1,000#	825
Total Utilities	6,212
Total Direct Operating Cost	$28,069

* Pitch used to supplement refinery gas.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE III

ESTIMATED UTILITIES

Electricity	KW
Crude, Vacuum and Stabilizer Units	575
Light Naphtha Unifining Unit	290
Heavy Naphtha Unifining Unit	405
Distillate Unifining Unit	800
B-T-X Platforming Unit	1,075
Heavy Naphtha Platforming Unit	1,285
UDEX Unit	255
Naphthalene Hydeal Unit	840
F.C.C. and Gas Concentration Units	7,780
Visbreaking Unit	550
F.C.C. Gasoline Merox Unit	10
C_3/C_4 Merox Unit and C_3/C_4 Splitter	33
Subtotal	13,898
Miscellaneous and Offsites	2,140
Total	16,038

Fuel	10^6 BTU/Hr
Crude, Vacuum and Stabilizer Units	-327
Light Naphtha Unifining Unit	- 31
Heavy Naphtha Unifining Unit	- 46
Distillate Unifining Unit	- 38
B-T-X Platforming Unit	- 93
Heavy Naphtha Platforming Unit	-119
UDEX Unit	- 2
Naphthalene Hydeal Unit	- 60
F.C.C. and Gas Concentration Units	-
Visbreaking Unit	-104
F.C.C. Gasoline Merox Unit	-
C_3/C_4 Merox Unit and C_3/C_4 Splitter	-
Subtotal	-820
Boiler House	- 78
Total	-898
BTU/Day required	21,600 x 10^6 BTU
BTU/Day from fuel gas	16,400 x 10^6 BTU
BTU/Day needed to be purchased	5,200 x 10^6 BTU

Therefore 825 B/D pitch used to supplement refinery fuel gas.

TABLE III

ESTIMATED UTILITIES

Page 2

Cooling Water	GPM
Crude, Vacuum and Stabilizer	10,850
Light Naphtha Unifining Unit	980
Heavy Naphtha Unifining Unit	1,450
Distillate Unifining Unit	1,790
B-T-X Platforming Unit	2,650
Heavy Naphtha Platforming Unit	3,900
UDEX Unit	4,320
Naphthalene Hydeal Unit	3,800
F.C.C. and Gas Concentration Units	11,550
Visbreaking Unit	4,300
F.C.C. Gasoline Merox Unit	-
C_3/C_4 Merox Unit and C_3/C_4 Splitter	640
Total	46,230

Steam	1,000 Lbs/Hr
Crude Vacuum and Stabilizer	-39.0
Light Naphtha Unifining Unit	-
Heavy Naphtha Unifining Unit	-
Distillate Unifining Unit	-
B-T-X Platforming Unit	-
Heavy Naphtha Platforming Unit	-
UDEX Unit	-65.0
Naphthalene Hydeal Unit	- 1.0
F.C.C. and Gas Concentration Units	-
Visbreaking Unit	-
F.C.C. Gasoline Merox Unit	-
C_3/C_4 Merox Unit and C_3/C_4 Splitter	- 9.5
Subtotal	-114.5
Offsites and Miscellaneous	- 8.0
Total	-122.5
B-T-X Platforming Steam Generator	-
Heavy Nap. Platforming Steam Generator	-
F.C.C. Steam Generator and Visbreaker	+ 60.0
Boiler House	+ 62.5
Total	+122.5

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE IV

ESTIMATED PERSONNEL REQUIREMENTS

	Per Day*
Management	
Manager	1
Assistant Manager)	1
Process Superintendent)	
Chief Engineer)	1
Mech. Superintendent)	
Personnel Manager	1
Chief Chemist	1
Comptroller	1
With Above:	
Secretaries	6
Total Management	12
Office	
General Accounting Manager)	1
Refinery Accounting Manager)	
Oil Accounting Manager	1
Material Accounting Manager	1
Accounting Clerks	2
Yield Accountant	1
Billing Clerk	1
Tanker Agent	1
Payroll Clerk	3
Shipping Clerk)	3
Purchasing Agent)	
Office Service:	
Receptionist/Telephone Operator	1
Stenographers & Typists	8
Total Office	23
Laboratory	
Chemists	6
Knock Tester	1
Podbielniak Operator	1
Technicians	11
Washers	3
Samplers	4
Total	26

* 5-Day work week - 8 hours per day.

TABLE IV

ESTIMATED PERSONNEL REQUIREMENTS

Page 2

	Per Day*
Safety	
Chief Safety Engineer	1
Asst. Chief Safety Engineer	1
Fireman & Safety Personnel	6
Total	8
Technical & Economics	
Technical Superintendent)	
Economics Superintendent)	1
Engineers	6
Secretary	1
Total	8
Warehouse	
Chief Storekeeper	1
Assistant	2
Clerks	2
Helpers	6
Total	11
First Aid	
Doctor	1
Medical Assistant	1
Nurses	3
al	5
General Workers & Security	
Chief Watchman	1
Shift Watchman	15
Porters	4
Yardmen	4
Total	24

* 5-Day work week - 8 hours per day.

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TABLE IV

ESTIMATED PERSONNEL REQUIREMENTS

Page 3

Maintenance	Per Day*
Chief Mechanical Engineer	1
Chief Civil Engineer	1
Draftsmen	3
Mechanical Foreman	6
Pipefitters	3
Pipefitters Helpers	9
Welders	2
Welders Helpers	2
Machinists	4
Machinists Helpers	8
Pump Mechanics	3
Pump Mechanics Helpers	3
Boiler Makers	4
Boiler Makers Helpers	4
Chief Electrician	1
Electricians	3
Electrician Helpers	3
Instrument Men	6
Carpenters	2
Carpenters Helpers	2
Painters	2
Painters Helpers	2
Insulator	4
Bricklayers	1
Bricklayers Helpers	1
Masons	2
Masons Helpers	2
Truck Drivers	6
Garage Mechanics, etc.	6
Labor Foremen	2
Laborers	40
Total	138

Oil Movement	
Superintendent	1
Assistant Superintendent	1
Cargo Inspector	1
Pumpers	9
Pumper Helpers	9
Gaugers	9
Dock Clerks	3
Pumpers	3
Pipe Fitters	4
Pipe Fitters Helpers	10
Truck Loaders	4
Truck Loaders Helpers	4
Oil Separator Operator	4
Total	62

* 5-Day work-week - 8 hours per day.

TABLE IV

ESTIMATED PERSONNEL REQUIREMENTS

Page 4

Operations	Per Shift
Shift Foreman	1
Crude, Vacuum & Stabilizer	
Senior Operator	1
Board Man	1
Helper	2
Visbreaking Unit	
Senior Operator	1
Board Man	1
Helper	1
Naphtha Unifiner - R-T-X Platformer-Udex	
Senior Operator	1
Board Man	2
Helper	3
Naphtha Unifiner - Platformer - Hydeal	
Senior Operator	1
Board Man	2
Helper	3
Distillate Unifiner	
Senior Operator	1
Helper	1
F.C.C. & Gas Con.	
Senior Operator	1
Board Man	1
Helper	2
Boiler House	
Senior Operator	1
Water Treating & Pumping	2
Treaters & Splitter	
Board Man	1
Helper	1
Total	31

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE V

ESTIMATED PERSONNEL REQUIREMENTS & COSTS

	No.	$/SD
Management	12	642
Office	23	262
Laboratory	26	346
Safety	8	100
Technical & Economics	8	176
Warehouse	11	182
First Aid	5	63
General Workers & Security	24	300
Maintenance	138	1,800
Oil Movement	62	583
Operations	131	2,414
Total	448	6,868

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VI

ESTIMATED PROCESS INVESTMENT

PROCESS UNITS	Material & Labor Cost
1. Crude Unit Including desalter, full corrosion protector and stabilizer	$ 2,000,000
2. Vacuum Unit	1,200,000
3. Light Naphtha Unifining Unit	550,000
4. Heavy Naphtha Unifining Unit	700,000
5. Distillate Unifining Unit	1,200,000
6. B-T-X Platforming Unit	1,350,000
7. Heavy Naphtha Platforming Unit	1,650,000
8. Udex Unit	1,550,000
9. Naphthalene Hydeal Unit	2,200,000
10. F.C.C. Unit 11. Gas Concentration Unit	5,345,000
12. Visbreaking Unit	2,100,000
13. F.C.C. Gasoline Merox Unit	80,000
14. C_3/C_4 Merox Unit	75,000
Process Units - Total M & L	$20,000,000
Design, engineering, contractor's expense and overhead	4,000,000
Total	$24,000,000
Allowance for ocean freight, local freight, unloading and hauling to site	$ 3,000,000

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VII

ESTIMATED OFFSITES FACILITIES INVESTMENT

	Material and Labor
Utilities	
Steam Generating System, Water Treating Facilities, Fresh Water Supply, Refinery Fuel System, Cooling Water System, Electric Power System, Compressed Air System	$ 2,050,000
Service Facilities	
TEL Blending, Fire Fighting Equipment Refinery Flare and Blowdown System Oil Separation and Retention Pond Sewer System Telephone System Fencing and Gates Roads and Parking Areas Truck Load Racks	1,500,000
Buildings and Contents	800,000
Tankage and Accessories	
Tankage, Tankage Accessories, Transfer Pumps, Yard Piping	10,500,000
	$14,850,000
Design, engineering, contractor's expense and overhead	3,000,000
	$17,850,000
Allowance for ocean freight, local freight, unloading and hauling	$ 2,150,000

Not included in above estimates are the following:

Land
Docks and Wharfs
Site Preparation
Piling - if required.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VIII

ESTIMATED INITIAL INVENTORY REQUIREMENTS

	Barrels	Dollars
1. Charge Stocks		
Crude, 20 days inventory	1,200,000	$ 2,820,000
2. Products		
Gasoline		
Premium, 25 days inventory	118,000	586,000
Regular, 25 days inventory	275,000	1,275,000
Benzene, 30 days inventory	18,000	238,000
Toluene, 30 days inventory	20,800	157,000
C8 Aromatics, 30 days inventory	21,700	137,000
Raffinate, 25 days inventory	78,200	317,000
Naphthalene, 30 days inventory	13,300	264,000
Mixed C3's, 15 days inventory	35,000	103,000
Mixed C4's, 15 days inventory	37,600	111,000
#2 Fuel Oil, 25 days inventory	298,000	1,025,000
#6 Fuel Oil, 25 days inventory	335,000	720,000
Total	1,250,600	$4,934,000
3. Catalyst Initial Loading and a Spare Loading	Pounds	
F.C.C.	980,000	$ 176,000
Naphtha Unifiners	64,600	103,000
Distillate Unifiner	44,500	46,000
B-T-X Platformer	34,500	138,000
Hvy. Nap. Platformer	70,000	556,000
Hydeal	81,000	81,000
Total	1,274,600	$1,152,000
4. Spare Parts		$ 792,000
TOTAL		$9,698,000

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE IX

ESTIMATED STARTUP AND WORKING CAPITAL

Section 1 - Startup Capital

A. Labor - 60 Days Supervision	$ 267,200
30 Days Operating & Training	72,400
B. Utilities - 30 Days Startup & Training	202,000
Total Startup Capital to Depreciable Capitalization	$ 541,600

Section 2 - Working Capital

A. Charge Stock, 20 days inventory	$2,820,000
B. Products, necessary inventory	4,934,000
C. Direct Operating Costs - 30 days	650.000
Total Working Capital to Non-Depreciable Capitalization	$8,404,000

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE X

ESTIMATED TOTAL INVESTMENT

Initial Catalyst and Chemical Loading and Spare Parts	$ 1,944,000
Process Investment	27,000,000
Offsites Investment	20,000,000
Startup and Working Capital	
a. Depreciable	541,600
b. Non-depreciable	8,404,000
Total	$57,889,600

PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY

SECTION 5

PROCESS DESCRIPTION AND YIELDS

INTRODUCTION

This scheme is for processing 60,000 BSD of Tia Juana Medium Crude to produce normal petroleum fuels that will meet current and future markets as far as quality is concerned for the east coast markets of the United States. This scheme has also been developed to produce some of the normal petrochemicals that are commonly derived from petroleum sources.

Block flow diagram No. 76823-C-0 shows the general processing scheme that is utilized in this case. The main considerations were to produce normal petroleum fuels that will meet general product specifications as well as producing petrochemical as derived from petroleum sources. The production of No. 6 fuel oil and pitch will be determined by the local market capacity of consuming pitch as an industrial fuel. The petrochemicals so produced are common materials that the modern day refiner can readily obtain without upsetting his petroleum duels production.

For example: If the quantity of pitch as shown produced in this case cannot be consumed as a local industrial fuel there are several possible alternatives that could be used to reduce the quantity to meet current market demands.

a. The capacity and conversion level of the FCC unit could be chosen to produce sufficient cycle oil to cut the vacuum bottoms, after pitch viscosity breaking, to No. 6 fuel oil.

b. Maintain the capacity and conversion level of the FCC unit as presented using all the cycle oil and sufficient virgin distillate (500-650°F.) to cut the vacuum bottom, after viscosity breaking to No. 6 fuel oil. This would lower the amount of No. 2 fuel oil for sale.

c. Virgin vacuum bottoms from Tia Juana Medium Crude is readily adaptable for producing asphalt. The amount of virgin vacuum bottoms routed into asphalt is determined by local markets for such items as (1) highway expansion and repair programs, (2) roofing materials, etc.

d. Virgin vacuum bottoms could be routed to a low pressure coking unit to produce petroleum coke and upgrade vacuum bottoms into more profitable items. Petroleum coke derived from Tia Juana Medium Crude has in general, properties that could be acceptable for several end uses of coke.

PROCESS FLOW

Crude Desalting

While the crude used for this study does not show an appreciable amount of salt, electrical desalting equipment is provided to enable crudes to be processed, which are less satisfactory in this regard.

ATMOSPHERIC DISTILLATION

In this scheme one 60,000 BSD unit is considered rather than the possibility of two smaller units of 30,000 BSD capacity each.

Preflashing or prefractionation is chosen to give the most economical use of heat. A light straight run stabilizer is provided. The Tia Juana Medium light straight run in particular needs to be stabilized and while the stabilizer could be omitted with the light straight run stabilized in the FCC Gas Recovery unit, this would reduce operating flexibility. Only one grade of gasoline then could be produced.

A light naphtha, 165-270°F., is taken overhead from the atmospheric crude column and is processed in a Unifiner for sulfur removal and is further processed as described later. A heavy naphtha, 270-450°F., is taken as a side stream from the crude column and is processed in a Unifiner for sulfur removal and to further processing as described later. A middle distillate (450-650°F.) is taken as a side stream from the crude tower, processed in a Unifiner for sulfur reduction and sent to storage as a finished product. The reduced crude from the bottom of the crude tower is sent to vacuum unit.

VACUUM DISTILLATION

The function of this unit is to prepare vacuum gas oil as charge to the FCC unit. It should be designed carefully to keep entrainment of asphalt from the gas oil to a minimum and thus at the same time keep the metal contaminants, harmful to the FCC operation, at a minimum in the FCC feed. The vacuum pitch obtained from the bottom of the vacuum unit is sent to the visbreaking unit.

VISBREAKING UNIT

Visbreaking is particularly advantageous in a dual process function. It prepares distillate stocks and at the same time reduces the viscosity of residual bottoms so that less cutback material is required to meet No. 6 fuel oil specification. Light materials from this operation are sent to FCC Gas Recovery system for recovery of the C_3's and C_4's. The visbreaker gasoline is split into two fractions, a C_5-270°F. and a 270-400°F. material. Each fraction is joined with the respective virgin naphtha fraction, processed in a Unifiner for sulfur reduction and olefin saturation, and then to further processing as described later. The vacuum pitch is sold with cycle stock (FCC cycle oils) as No. 6 fuel oil or burned as a fuel within the refinery or by other industrial consumers close to the refinery.

FLUID CATALYTIC CRACKING
AND GAS RECOVERY UNITS

This system of Catalytic Cracking has been chosen as it has been most widely accepted in the industry and is the most representative. The function of this unit is to convert heavy distillate oils into high octane gasoline and to reduce the overall refinery fuel oil production. Current designs are noted for simplicity, ease of operation and low operating and investment costs. The process also gives good yields of mixed C_3 and C_4 saturate and olefin compounds which can be used for alkylation, catalytic condensation or for petrochemical intermediates.

Charge stock for the FCC has been prepared by the vacuum unit. A conversion level of 70% has been used in this scheme for maximizing light olefin production. However, as mentioned in the introduction, if the pitch sales are not large, conversion level could be reduced for sufficient cycle oils to be produced for blending into No. 6 fuel oil.

FLUID CATALYTIC CRACKING
AND GAS RECOVERY UNITS (Cont'd)

The gas recovery section (gas concentration) may receive, in addition to the light products from the FCC unit, light products from other refinery sources as straight run stabilizer overhead, Platforming debutanizer overhead and the visbreaking light material. The gas recovery section produces fuel gas, mixed C_3's and C_4's and a debutanized gasoline which is routed to the gasoline pool as a blending component.

LIGHT AND HEAVY NAPHTHA UNIFINING UNITS

An uncomplicated, easily operated process for eliminating sulfur, nitrogen and metallic impurities from petroleum distillates, Unifining provides a simple and economical answer to an operating problem that is frequently difficult and costly to solve by other methods. Also Unifining will simultaneously saturate any olefin present in the feedstocks. It clearly removes impurities and prepares feedstocks of ideal properties for further processing.

Unifining works particularly well in combination with Platforming. It is ideal for pretreating Platformer feedstocks and the excess hydrogen from the Platformer is an excellent, low cost hydrogen source for the unit.

The feed to each of the naphtha Unifiners is comprised of the respective boiling range virgin naphthas from the crude unit and the visbreaker gasolines. Sulfur reduction and olefin saturation occurs during this operation. Hydrogen required for these steps is received from the Platforming unit. H_2S and light materials produced during Unifining are stripped in the Unifiner stripper. The stripper bottoms then become charge to the Platforming unit.

B-T-X PLATFORMING AND
HEAVY NAPHTHA PLATFORMING UNITS

This is one of the most widely used processes in the refining industry. In operation on a broad scale it has proved to be practical and an economical process for upgrading low octane gasolines.

Platformer feedstock is received from the Unifiner stripper. Processing conditions are selected so that a 90 F-1 clear C_5+ Platformate is obtained from the Platformer debutanizer and is routed to the gasoline pool as a high octane

B-T-X PLATFORMING AND
HEAVY NAPHTHA PLATFORMING UNITS (Cont'd)

blending component. The debutanizer overhead material is sent to the FCC recovery unit for recovery of propane, iso and normal butanes present in the streams. The net separator gas becomes a source of low cost hydrogen for the Unifining operation.

Under proper operating conditions, Platforming fits well into the growing demand for petrochemicals as it is highly efficient for producing a material that contains aromatics such as benzene, toluene and xylenes and these can be readily extracted from the Platformate. As in this scheme, a Unifined naphtha in the boiling range of 165-270°F. is the feedstock for B-T-X Platforming operations. A depentanized Platformate is obtained and this becomes feedstock to a Udex unit as described later. A C_5's and C_4's fraction is recovered and sent to the gasoline pool as a blending component. The depropanizer overhead material is sent to the FCC gas recovery unit for recovery of propane. The net separator gas becomes a source of low cost hydrogen for the Unifining operation.

Within a recent period, under proper operating conditions, it has been found that the Platforming process may produce a material from which naphthalene could be derived. As in this scheme, a Unifined naphtha in the boiling range of 270-450°F. is the feedstock for heavy naphtha Platforming operations. A total depropanized Platformate is obtained which is rerun into a C_4-390°F. and a 390-E.P.°F. fraction. The C_4-390°F. fraction is routed to the gasoline pool as a blending component. The 390°-E.P. fraction becomes a feedstock for further processing as described later for naphthalene production. The depropanizer overhead material is sent to the FCC gas recovery unit for recovery of propane. The net separator gas becomes a source of low cost hydrogen for the naphthalene operation.

DISTILLATE UNIFINING

This proposed method of distillate treating, where hydrogen is available, is based on Universal's considerable experience in the Unifining of distillate oils. Sulfur reduction to meet specifications is the prime function of this operation and the required reduction is readily obtained.

DISTILLATE UNIFINING (Cont'd)

The middle virgin distillate (450-650°F.) as obtained from the crude column combines with a necessary portion of the B-T-X Platformer net separator gas and after heating passes into the Unifiner reactor system. Sulfur reduction in the distillate fraction is the prime purpose of this operation. The product after the Unifiner reactor is stripped and rerun to meet flash point specification to give a product as No. 2 fuel oil.

UDEX EXTRACTION AND B-T-X RECOVERY UNIT

The Udex process is designed to prepare high purity aromatics from catalytic reformate. The Udex process has been proved commercially to be an outstanding method for the preparation of aromatics of purities not previously attained. The aromatic products of the Udex process will not only meet the established ASTM nitration grade specifications but will exceed them. Nitration grade benzene has a minimum solidification point of 4.85°C. The benzene produced commercially from catalytic reformate processed in Udex units has consistently been well above the 5.40°C solidification point. The toluene fraction will have comparable freedom from paraffin impurities. High aromatic product purities are attained which maintains high recovery efficiencies. The benzene recovery efficiency attained in commercial Udex operation has been well above 99%.

The feedstock for the Udex unit in this proposed scheme is the depentanized Platformate obtained from the B-T-X Platforming operation. Through the extraction step, the extract product so obtained has a high purity aromatic content.

However, the extract contains traces of unsaturates, which would limit the purity of the final products and may also contain traces of residual non-hydrocarbon compounds which would spoil the acid-wash color test of the final products. To destroy these trace impurities the extract is processed through Attapulgas or similar clay before final distillation.

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UDEX EXTRACTION AND
B-T-X RECIVERY UNIT (Cont'd)

Redistillation of the product is accomplished in three columns in succession making pure benzene and toluene respectively as overhead products, a C_8 aromatic fraction as overhead product and a C_9 plus aromatics product off the bottom of the xylene column.

The isomer distribution in the C_8 aromatic fraction derived from petroleum stocks is approximately:

	Vol.%
ethylbenzene	20
p-xylene	18
m-xylene	42
o-xylene	20

The raffinate obtained from the extraction step is highly paraffinic and needs very little treatment before it is sent to storage. It can be used as a low octane blending component, a jet fuel blending component, or a charge stock for an ethylene cracking process.

HYDEAL

The Hydeal Process is a new process recently announced by Universal. This process is designed for the conversion of alkylbenzenes to benzene or alkylnaphthalenes to naphthalene.

The Hydeal unit proposed for this scheme is designed to convert alkylnaphthalenes to naphthalene. Feedstock is derived from the Heavy Naphtha Platforming operation. The 390-E.P.°F. Platformate fraction usually contains sufficient quantities of alkylnaphthalenes for economical conversion of these compounds into naphthalene. Also present in these feedstocks are some alkylbenzenes that are converted to benzene. The hydrogen source for this reaction is the net separator gas from the Heavy Naphtha Platforming operation.

MEROX

The UOP Merox Process is a fairly new process announced by Universal and is additional evidence of UOP's policy of providing the refining industry with every means for a well-rounded, profitable manufacturing operation. This process provides a low cost operation for treating gasoline and lower boiling fractions for removal of mercaptans, or sweetening heavier stocks by converting mercaptans to disulfides.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE XI

ESTIMATED GROSS MANUFACTURING MARGIN

	B/D	$/Bbl.	¢/Gal.	$/D
Products				
Gasoline				
Premium	4,713	4.979	11.86	23,424
Regular	11,000	4.628	11.02	50,908
Total	15,713			74,332
Benzene	600	10.50	25.00	6,240
Toluene	693	7.56	18.00	5,239
C_8 Aromatics	723	6.30	15.00	4,555
Raffinate	3,131	4.041	9.62	12,652
Naphthalene (¢/#)	442	-	(5.0)	8,810
Mixed C_3's	2,326	2.964	7.06	6,894
Mixed C_4's	2,505	2.964	7.06	7,425
#2 Fuel Oil	11,920	3.430	8.17	40,886
#6 Fuel Oil	13,396	2.151	5.12	28,815
Pitch	8,070	1.800	4.29	14,526
Value of Production	59,519	3.550		210,374
Charge				
Crude	60,000	2.350	5.60	141,000
Cost of Raw Material				141,000
Gross Manufacturing Margin				69,374

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XII

ESTIMATED REFINERY CONSOLIDATED YIELDS

Charge	B/D	Vol.%	#/Hr.	Wt.%
Tia Juana Medium Crude	60,000	100.0	780,000	100.00
Refinery Yield				
1. Gasolines				
Lt. St. Run	2,133	3.6	18,954	2.43
C_4-390°F. Platformate	6,200	10.3	70,902	9.09
F.C.C. Gasoline	7,380	12.3	82,056	10.52
	15,713	26.2	171,912	22.04
2. Benzene	600	1.0	7,722	0.99
3. Toluene	693	1.2	8,658	1.11
4. C_8 Aromatics	723	1.2	9,048	1.16
5. Raffinate	3,131	5.2	32,370	4.15
6. Naphthalene	442	0.7	7,332	0.94
7. Mixed C_3's	2,326	3.9	17,394	2.23
8. Mixed C_4's	2,505	4.2	21,528	2.76
9. #2 Fuel Oil	11,920	19.9	144,460	18.52
10. #6 Fuel Oil	13,396	22.3	192,742	24.71
11. Pitch*	8,070	13.4	118,716	15.22
12. Fuel Gas (F.C.E.)	1,420	2.4	30,880	3.96
13. Carbon Burned	-	-	17,238	2.21
Total	60,939	101.6	780,000	100.00

* Includes 825 B/D Pitch used to supplement refinery fuel gas.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIII

ESTIMATED CRUDE AND VACUUM UNIT YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Tia Juana Medium Crude	27.1	60,000	100.0	780,000	100.00	7.429
Yields						
I.B.P.-165°F.	-	2,040	3.4	17,706	2.27	-
165-270°F.	62.0	5,100	8.5	54,288	6.96	6.087
270-450°F.	45.4	7,680	12.8	89,544	11.48	6.660
450-650°F.	38.6	11,880	19.8	143,988	18.46	6.926
650-1000°F.	19.9	14,220	23.7	193,674	24.83	7.783
Vac. Botts.	8.6	19,080	31.8	280,800	36.00	8.412
		60,000	100.0	780,000	100.00	

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIV

ESTIMATED VISBREAKING YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Vac. Bottoms	8.6	19,080	100.0	280,800	100.00	8.412
Yields						
H_2S				618	0.22	
H_2				28	0.01	
C_1				899	0.32	
C_2=				365	0.13	
C_2				1,207	0.43	
C_3=		153	0.8	1,151	0.41	
C_3		210	1.1	1,488	0.53	
C_4=		210	1.1	1,769	0.63	
iC_4		57	0.3	534	0.19	
nC_4		76	0.4	702	0.25	
C_5-400°F.	56.0	1,755	9.2	19,319	6.88	6.283
Fuel Oil, 300 SFS @ 210°F.	8.6	17,172	90.0	252,720	90.00	8.412
		19,633	102.9	280,800	100.00	

TABLE XV

ESTIMATED B-T-X - PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Unifined Virgin 165-270°F.	62.0	5,100	86.3	54,273	86.37	6.087
Unifined Visbreaker 165-270°F.	63.4	810	13.7	8,568	13.63	6.044
	62.4	5,910	100.0	62,841	100.00	6.075
Yields						
H_2				968	1.54	
C_1				170	0.27	
C_2				773	1.23	
C_3		243	4.12	1,804	2.87	
C_4's		352	5.95	2,916	4.64	
C_5's		324	5.48	2,916	4.64	
C_6 Paraffins		821	13.90	7,830	12.46	
C_7 Paraffins		795	13.46	7,855	12.50	
C_8 Paraffins		616	10.43	6,259	9.96	
C_{9+} Paraffins		215	3.63	2,218	3.53	
Methyl Cyclopentane		121	2.04	1,307	2.08	
Cyclohexane		17	0.29	195	0.31	
C_7 Naphthenes		69	1.16	760	1.21	
C_8 Naphthenes		29	0.49	327	0.52	
C_{9+} Naphthenes		17	0.29	189	0.30	
Benzene		255	4.32	3,243	5.16	
Toluene		722	12.22	9,043	14.39	
C_8 Aromatics		804	13.60	10,028	15.96	
C_{9+} Aromatics		319	5.40	4,040	6.43	
		5,719	96.78	62,841	100.00	

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVI

ESTIMATED UDEX YIELDS

Charge

Depentanized Platformate - see Table , Estimated B-T-X Platforming Yields

Yields

Extract

Platforming Yields, B/D		Recovery Factors	Recovered
Benzene	255	99%	253
Toluene	722	96%	693
C8 Aromatics	804	90%	723
		Total	1,669

Raffinate	B/D
C_6 Paraffins	821
C_7 Paraffins	795
C_8 Paraffins	616
C_{9+} Paraffins	215
Methyl Cyclopentane	121
Cyclohexane	17
C_7 Naphthenes	69
C_8 Naphthenes	29
C_{9+} Naphthenes	17
Benzene	2
Toluene	29
C_8 Aromatics	81
C_{9+} Aromatics	319
	3,131

General Properties of Raffinate

F-1 Cl	62.0
F-1 +3 cc	80.0
RVP	3.5

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVII

ESTIMATED HEAVY NAPHTHA PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Unifined Virgin 270-450°F.	45.4	7,680	89.0	89,507	89.27	6.660
Unifined Visbreaker 270-400°F.	50.2	945	11.0	10,759	10.73	6.483
	45.9	8,625	100.0	100,266	100.00	6.641

Yields				
H_2			1,263	1.26
C_1			2,216	2.21
C_2			2,838	2.83
C_3			3,830	3.82
C_4's	496	5.75	4,161	4.15
C_5's	492	5.70	4,502	4.49
Hexanes+	6,644	77.03	81,456	81.24
	7,632	88.48	100,266	100.00

Deprop. Botts - C_4+ Platformate	B/D	°API	RVP	F-1 Cl	F-1 +3cc
Total Bottoms	7,440	42.1	6.07	94.9	99.8

Platformate Split	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
C_4-390°F. Platformate	48.8	6,200	83.3	70,941	80.23	6.534
390-E.P. Platformate	15.0	1,240	16.7	17,484	19.77	8.044
	42.1	7,440	100.0	88,425	100.00	6.736

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVIII

ESTIMATED NAPHTHALENE HYDEAL YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Heavy Platformate	15.0	1,240	100.0	17,480	100.00	8.044
H_2 (710 SCF/100#)	-	-	-	660	3.78	-
				18,140	103.78	
Yields						
Benzene	28.3	351	28.3	4,545	25.00	7.375
Naphthalenes				7,345	40.60	
Hvy. Aromatics	31.0	40	3.3	525	2.90	7.251
Fuel Gas (methane)				5,725	31.50	
				18,140	100.00	

Fuel Gas* - 1,180 Bbl. F.O.E.

* Fuel Gas contains components both from Hydeal Operations and the Hvy. Nap. Platformer separator gas.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIX

ESTIMATED F.C.C. YIELDS

Charge	°API	B/D	Vol.%	#/Hr.	Wt.%	#/Gal.
Virgin Gas Oil	19.9	14,220	100.0	193,680	100.00	7.783
Yields						
H_2S				1,549	0.8	
H_2				194	0.1	
C_1				2,324	1.2	
C_2=				1,162	0.6	
C_2				1,743	0.9	
C_3=		981	6.9	7,360	3.8	
C_3		512	3.6	3,874	2.0	
C_4=		1,052	7.4	9,297	4.8	
iC_4		697	4.9	5,617	2.9	
nC_4		284	2.0	2,518	1.3	
C_5-480°F. @ 90% gasol.	54.0	7,380	51.9	82,120	42.4	
L.C.C.(610°F. @ 90%)	22.0	2,574	18.1	34,475	17.8	
HCO	19.0	1,009	7.1	13,750	7.1	
Cl. Sl.	9.0	711	5.0	10,459	5.4	
Coke				17,238	8.9	
				193,680	100.00	

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XX

ESTIMATED GAS CONCENTRATION UNIT YIELDS

	Crude #/Hr.	Hvy. Nap. Platf. #/Hr.	B-T-X Platf. #/Hr.	F.C.C. #/Hr.	Visb. #/Hr.	Total #/Hr.	Fuel Gas #/Hr.	BTU/#	Recovered #/Hr.	Recovered B/D
H_2	--	24	15	194	28	261	261	61,029	--	--
C_1	--	258	18	2,324	899	3,499	3,499	23,886	--	--
$C_2^=$	--	--	--	1,162	365	1,527	1,527	21,639	--	--
C_2	--	1,160	288	1,743	1,207	4,398	4,398	22,325	--	--
$C_3^=$	--	--	--	7,360	1,151	8,511	1,277	21,047	7,234	958
C_3	2,890	2,600	1,200	3,874	1,488	12,052	1,808	21,664	10,244	1,368
$C_4^=$	--	--	--	9,297	1,769	11,066	221	20,766	10,845	1,230
iC_4	222	201	225	5,617	534	6,799	136	21,239	6,663	813
nC_4	510	246	156	2,518	702	4,132	83	21,301	4,049	462
	3,622	4,489	1,902	34,089	8,143	52,245	13,210		39,035	4,831

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Recovery Factors:

C_3's	85%
C_4's	98%

Fuel Gas - 1,170 Bbl. F.O.E.

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TABLE XXI

ESTIMATED GASOLINE POOL

Components	B/D	Vol.%	F-1 Cl	F-1 +3cc	RVP
Lt. St. Run	2,133	13.6	78.5	96.0	34.47
C_4-390°F. Platformate	6,200	39.5	92.5	98.6	7.00
C_5+ F.C.C. Gasoline	7,380	46.9	94.0*	98.8*	5.50
	15,713	100.0	91.4	98.5	10.0

T.E.L. requirement
to meet Pool Octane of 95.7 = 1.0 cc T.E.L./gal.

* Blending values

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XXII

ESTIMATED H_2 PRODUCTION AND CONSUMPTION

Production		
B-T-X Platformer	5,910 B/D x 729 SCF/bbl.	= 4.31 x 10^6 SCF/D
Hvy. Nap. Platformer	8,625 B/D x 647 SCF/bbl.	= 5.58 x 10^6 SCF/D
		9.89 x 10^6 SCF/D
Consumption*		
Lt. Nap. Unifiner	5,910 B/D x 108 SCF/bbl.	= 0.64 x 10^6 SCF/D
Hvy. Nap. Unifiner	8,625 B/D x 117 SCF/bbl.	= 1.01 x 10^6 SCF/D
#2 F.O. Unifiner	11,880 B/D x 126 SCF/bbl.	= 1.50 x 10^6 SCF/D
Hydeal Unit	1,240 B/D x 4498 SCF/bbl.	= 5.58 x 10^6 SCF/D
		8.73 x 10^6 SCF/D

* Consumption includes chemical and solution losses.

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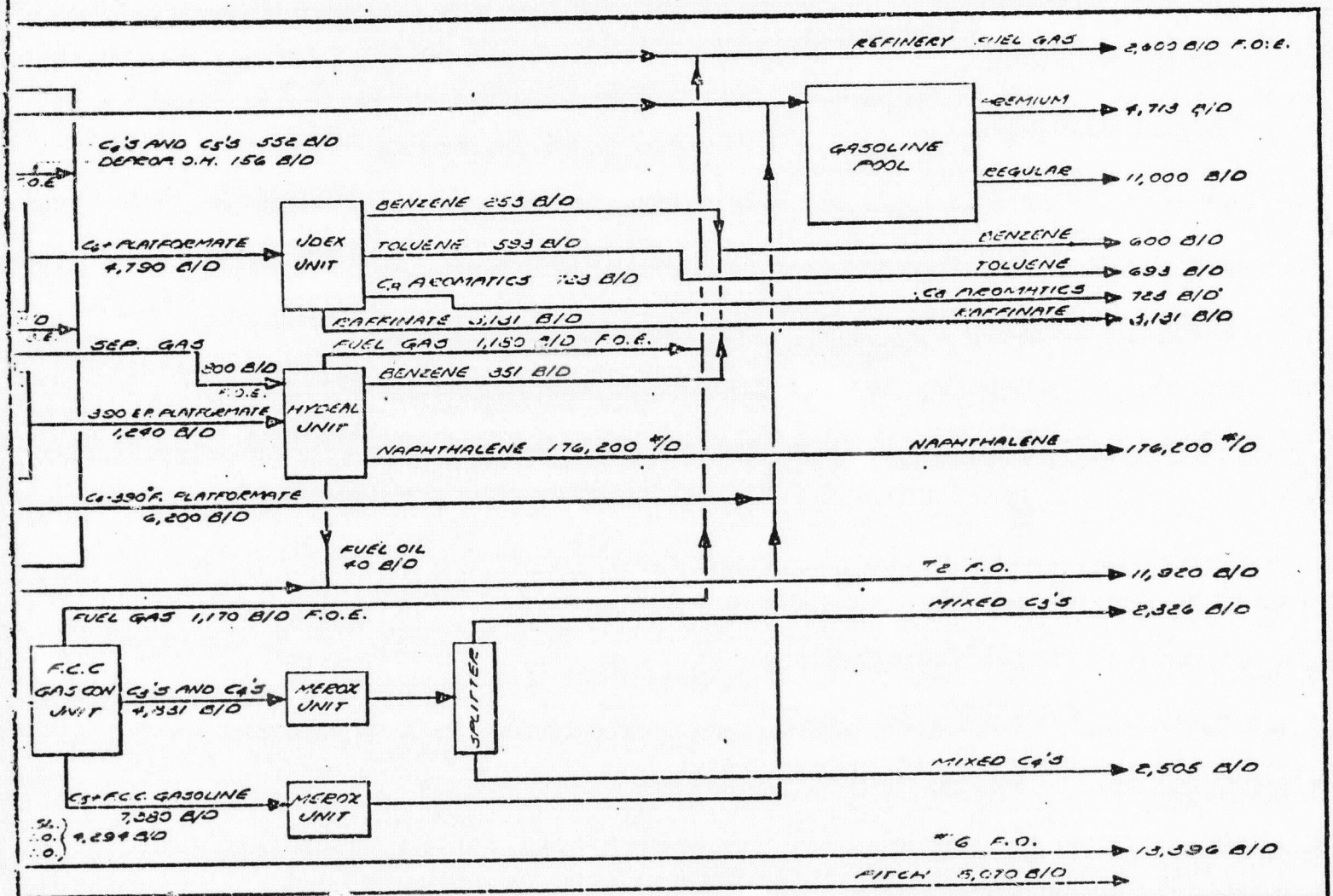

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UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD DES PLAINES, ILLINOIS, U.S.A.

BLOCK FLOW DIAGRAM
OF
NORMAL REFINERY FUELS & PETROCHEMICALS
PROPOSED PUERTO RICO REFINERY

DR. WSE CH. E.H.S. DWG. NO. 76823 -C- REV. 0

DATE 4-10-69

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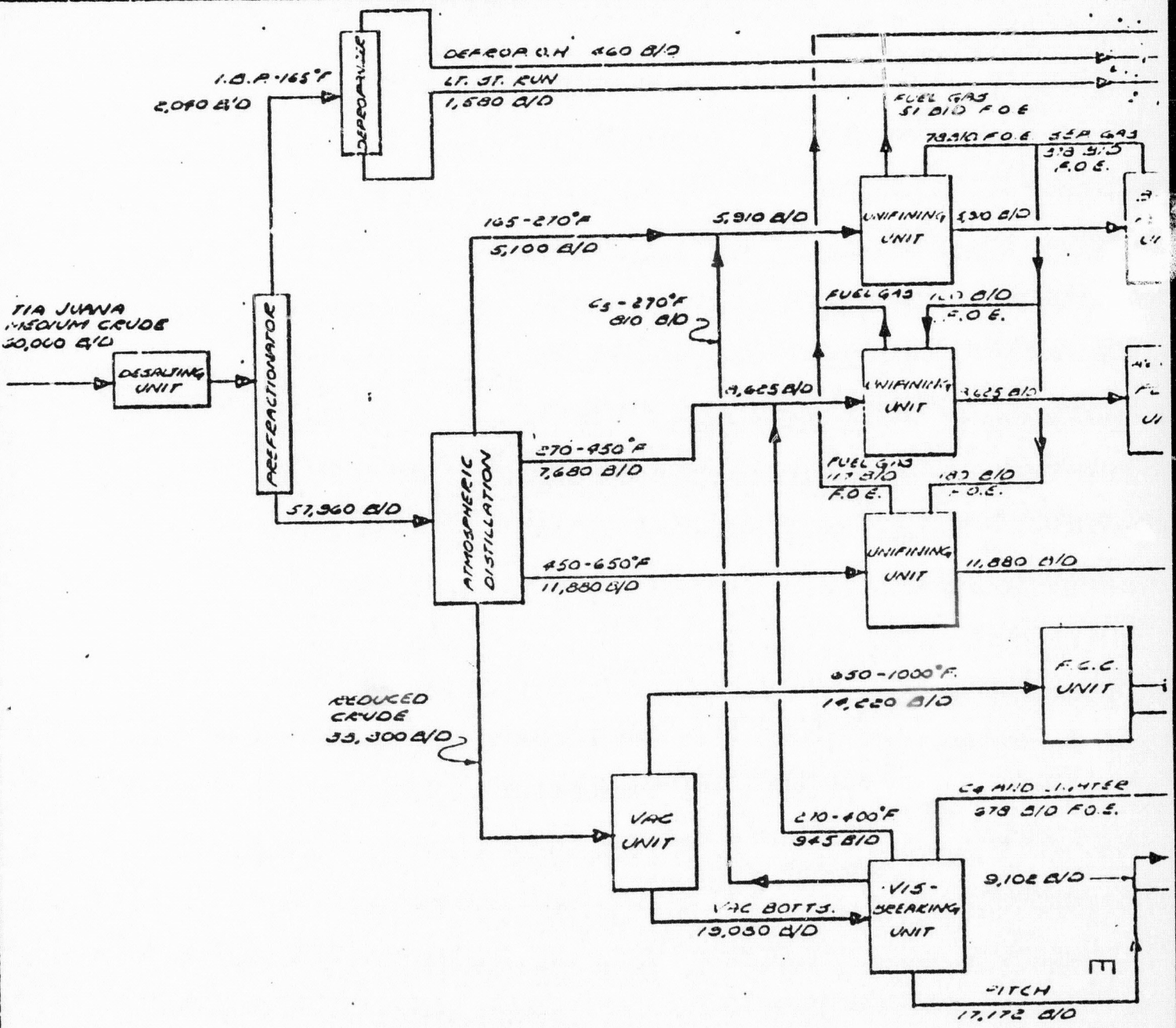

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PX-631-A ~ 7/6/73

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

SECTION 6

Possible Petrochemical Complex

Introduction

In this section of the report an attempt has been made to present a scheme that is one of many open for an overall petrochemical complex based on the petrochemical derived from Case II operations. The overall petrochemical complex visualized is shown on the attached block flow diagram, Drawing No. 74761-C-0, and consists of essentially two major processing sequences:

1. Aromatic derived chemicals
2. Olefin derived chemicals

There is some overlapping of the two divisions for both aromatic and olefin compounds are used jointly as feedstocks to some of the units shown in the scheme.

The efficient operation of each process sequence is a major factor for superior product quality and high on-stream operating factors in the secondary processes producing finished products. It may be concluded that careful selection of well-established processes and architect engineers is a prime requisite for the successful economic culmination of a petrochemical project of the scope and magnitude that is projected in this report.

There is only one company which offers as wide a variety of competitive processes having commercial application throughout the world. Universal Oil Products Company offers most of the processes required to produce the primary petrochemicals visualized in this study. The commercial experience required to design an efficient and economical petrochemical complex is present at Universal. Moreover, Universal has the expert personnel geared to train the operators required to operate and maintain an efficient organization. And, Universal is obligated by its process license agreements to maintain the competitive nature of its plants by making available to the licensee advances in the technology as they are made. Universal working closely with your selected prime contractor forms a closely knit team, that assures proper design, construction and operation of the proposed facilities.

Aromatic Derived Chemicals

The Hydeal Process is a new process recently announced by Universal. This process is designed for the conversion of alkylbenzene to benzene or alkylnaphthalenes to naphthalene as was presented in Case II scheme. The toluene to benzene route has received a great deal of attention with several commercial units on-stream at this time and several other units to go on-stream later this year or early 1963.

The Hydeal unit proposed in this petrochemical complex is designed to convert toluene to benzene. The hydrogen source could be from a Platforming unit or hydrogen generating facilities. The toluene feed is derived from the UDEX unit as proposed in Case II. There exists an integration of the UDEX and Hydeal aromatic fractionation sequence that could be used to reduce the investment requirements and operating costs.

The UOP Hydrar Process is the only commercially available process for synthesizing cyclohexane having the anticipated quality indicated by freeze point of greater than 5° C. Two commercial units are now on-stream, one designed to operate on UDEX grade benzene. This unit has achieved the production of cyclohexane having a freeze point as high as 6.1° C. Product quality will meet or exceed the following specifications.

Cyclohexane

Solidifying	>5° C
Benzene content	0.1% maximum by wt.
Organic chloride content	1 ppm maximum
Saybolt color	+ 30
Sulfur	10 ppm maximum
Boiling range	>79.5° C. initial
Nonvolatile matter	<That in benzene feed
Specific gravity	0.777 to 0.784
Reid Vapor Pressure	3.5 psig maximum

The Hydrar unit proposed would be designed to convert either or both the benzene from the UDEX or Hydeal operations. The hydrogen source could be from a Platforming unit or hydrogen generating facilities.

The C_8 aromatic fraction obtained from Case II UDEX operation contains the following approximate isomer distribution:

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	Vol.%
ethylbenzene	20
p-xylene	18
m-xylene	42
o-xylene	20

Under proper separation and fractionation operations the C8 aromatic fraction can be separated into the four chemical groups of a high purity content. Therefore, each of the compounds could be routed to further processing operations giving a wider petrochemical complex.

Olefin Derived Chemicals

A UOP Catalytic Condensation unit is proposed to produce nonenes, dodecenes, and heptenes which are chemical intermediates for further processing for OXO chemicals or in the case of dodecenes partial feedstock for final sulfonated detergents as described later. For the condensation unit, processing conditions would be selected to maximize the yields of each intermediate plus lesser amounts of light and heavy by-products over UOP Solid Phosphoric Acid Catalyst. For the nonenes and dodecenes operation, the proposed feedstock would be the mixed C_3's fraction obtained after splitting the mixed C_3's and C_4's stream from Case II Gas Recovery Unit. The feedstock for the heptene would be the mixed C_3's-C_4's fraction or the separate streams depending on the alternative usage of the streams.

Product quality will meet the following specifications:

Heptenes

	Min.	Max.
Dist. Range ASTM D-1078		
IBP	86.0° C (186.8° F)	
DP		102.0° C (215.6° F)
Total Olefins, Vol.%	95.0	
Analysis of Olefins, Vol.%		
C6		
C7	95.0	
C8		
Sulfur, ppm by weight		10
Chlorides, ppm by weight		10
Peroxide (active oxygen) ppm		25
Inhibitor (TBC) ppm	100	
Color, Saybolt	25	

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Nonenes (Tripropylene)

	Min.	Max.
Dist. Range ASTM D-1078		
IBP	137.5° C(279.5° F)	
DP		146.1° C(295° F)
% evaporation @ 274° F		6.0
Total Olefins, Vol.%	98.0	
Analysis of Olefins, Vol.%		
C_8		0.3
C_9	94.0	
C_{10}		5.7
Sulfur, ppm by weight		10
Chlorides, ppm by weight		10
Peroxide(active oxygen)ppm		25
Inhibitor (TBC), ppm	100	

Dodecenes (Tetrapropylene)

Dist. Range ASTM D-1078		
IBP	180° C(356° F)	
DP		205° C(401° F)
Total Olefins, Vol.%	98.0	
Analysis of Olefins, Vol.%		
C_{11}		6.0
C_{12}	90.0	
C_{13}		4.0
Sulfur, ppm by weight		10
Chlorides, ppm by weight		10
Peroxide(active oxygen), ppm		25
Inhibitor (TBC), ppm	100	

The mixed C_4's available from Case II are the basis for butadiene manufacture and motor aviation alkylate manufacture. Use of butylene extraction, isobutylene extraction, butylene dehydrogenation and butadiene extraction, has several advantages which are particularly significant when the dual objectives of butadiene and alkylate production are derived.

Product quality from the butadiene manufacture and aviation alkylate will meet the following specifications.

Aviation Alkylate

Will meet ASTM Designation D910-57-T for grade 115/145 aviation gasoline.

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Butadiene

C_3's	0.3
Butadiene	98.5* minimum
Isobutylene	0.2
N-butane	1.0
	100.0

The mixed C_3's and benzene available from Case II are the basis for phenol and acetone production. In considering the steps necessary to convert these raw materials into high purity phenol and acetone, the operations are done in two steps. The propylene contained in the mixed C_3's is alkylated with benzene via the UOP Catalytic Condensation Process using UOP solid phosphoric acid catalyst. The design of this unit is based on experience gained from a large number of commercial installations ranging in cumene production rates from 100 to 1,000 barrels per stream day. It should be noted that the process is quite versatile, being able to produce, besides cumene, nonenes, dodecenes, heptenes, motor polymer and other specialty polymers.

The Unisir Cumene Oxidation Process is a method for the preparation of phenol and acetone by the oxidation of cumene to the hydroperoxide followed by a cleavage step. The Unisir process has been proved commercially to be an economical method for the production of phenol and acetone in high yields.

Product specifications are as follows:

Phenols

Solidification point (anhydrous basis)	40.6° C	Min.
Nonvolatile residue, Wt. %	0.02	Max.

Acetone

Purity, Wt. %	99.5	Min.
Other specifications equal to or exceeding ASTM Designation D329-58		

Again the mixed C_3's and benzene available from Case II are the basis for other petrochemical material. Two basic process steps are involved in the production of detergent alkylate ready for sulfonation into finished detergent. The first of these is the Catalytic Condensation Process unit using UOP's Solid Phosphoric Acid Catalyst for the production of dodecenes (tetrapolypropylene). This material is an intermediate product, which is then used as feed to an olefin-

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aromatic alkylation unit. By-products from the polymerization operation include propane and minor amounts of light and heavy polymers.

The dodecene (or tetramer) is alkylated with benzene, using HF as catalyst, to produce detergent alkylate (dodecylbenzene). The by-product of the alkylation operation include minor amounts of light alkylate and alkylate bottoms.

The next step is the sulfonation of dodecylbenzene into dodecylbenzene sulfonates. This compound comprises over 50% of all synthetic detergents in the United States.

The UOP Alkar Process unit is designed for the production of ethylbenzene from the ethylene present in the Gas Recovery unit off-gas and benzene from the UDEX-Hydeal units. Use of the Alkar Process eliminates the requirement for a complicated gas concentration unit, thereby decreasing operating costs and initial capital investment. Although this process is fairly new, Universal has two commercial units in operation. The Alkar unit is followed by an ethylbenzene dehydrogenation unit based on using Shell 105 catalyst and styrene purification section. Universal has the technique and know-how to design the ethylbenzene dehydrogenation unit and purification section.

The quality of the styrene product would meet or exceed the following specifications:

Styrene - Polymer grade

Purity	99.60% min. by wt.
Aldehydes, as benzaldehyde	0.020% max. "
Peroxides, as hydrogen peroxide	0.010% max. "
Sulfur (as sulfur)	0.003% max. "
Chlorides (as chloride)	0.005% max. "
Polymer content	0.05% max. "
Solubility of polymer	Complete in benzene
Viscosity	0.87 centipoises max. at 25°C.
TBC (inhibitor)	10 ppm min. and 15 ppm max. for 30 days of 90° F.

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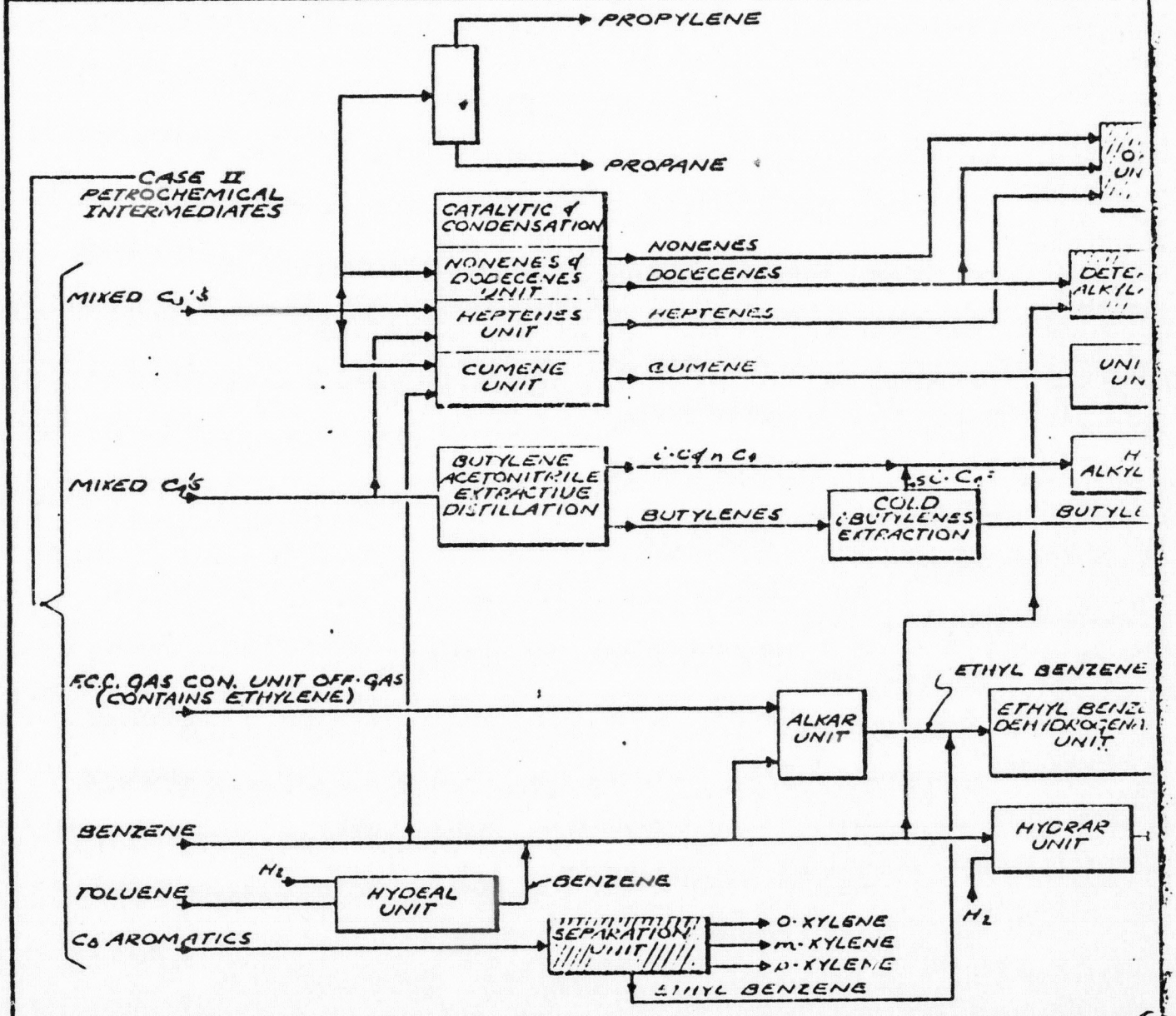

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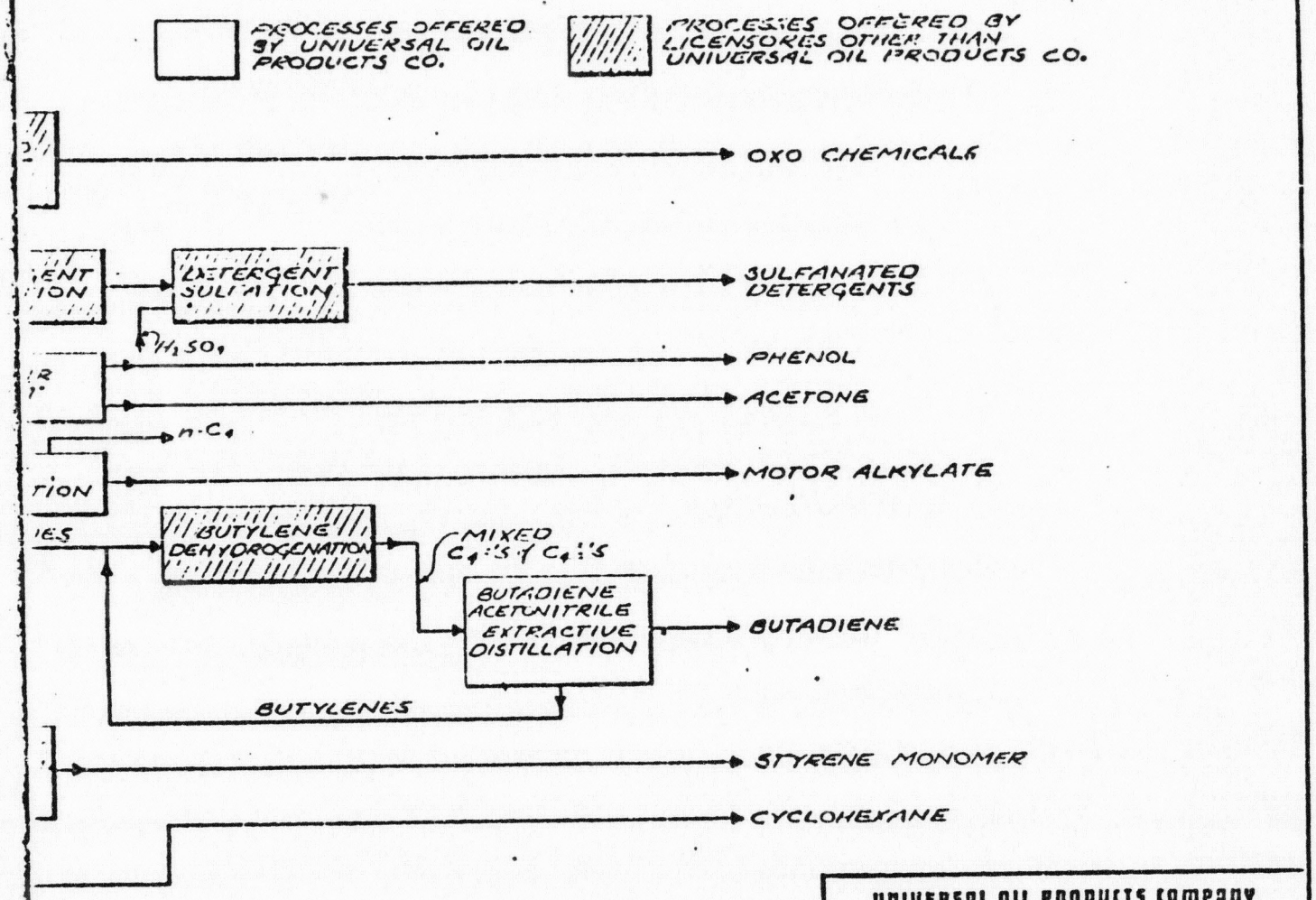

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30 ALGONQUIN ROAD DES PLAINES ILLINOIS U.S.A.

BLOCK FLOW DIAGRAM OF POSSIBLE PETROCHEMICAL COMPLEX

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J-25, Addendum to UOP Refinery Feasibility Study,
April 1962

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

APRIL, 1962

ADDENDUM

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY
LIST OF TABLES AND DRAWINGS

Table I	Estimated Net Operating Income
Table II	Estimated Direct Operating Cost
Table III	Estimated Utilities
Table IV	Estimated Personnel Requirements
Table V	Estimated Personnel Requirements and Costs
Table VI	Estimated Process Investment
Table VII	Estimated Offsites Facilities Investment
Table VIII	Estimated Initial Inventory Requirements
Table IX	Estimated Startup and Working Capital
Table X	Estimated Total Investment
Table XI ✓	Estimated Gross Manufacturing Margin
Table XII ✓	Estimated Refinery Consolidated Yields
Table XIII	Estimated Crude and Vacuum Unit Yields
Table XIV	Estimated Visbreaking Yields
Table XV	Estimated B-T-X Platforming Yields
Table XVI	Estimated UDEX Yields
Table XVII	Estimated Heavy Naphtha Platforming Yields
Table XVIII	Estimated Naphthalene Hydeal Yields
Table XIX	Estimated Isomax Yields
Table XX	Estimated Gas Concentration Unit Yields
Table XXI	Estimated Gasoline Pool
Table XXII	Estimated H_2 Production and Consumption
Drawing No. 76845-C-Rev.0	Block Flow Diagram of Normal Refinery Fuels and Petrochemicals.

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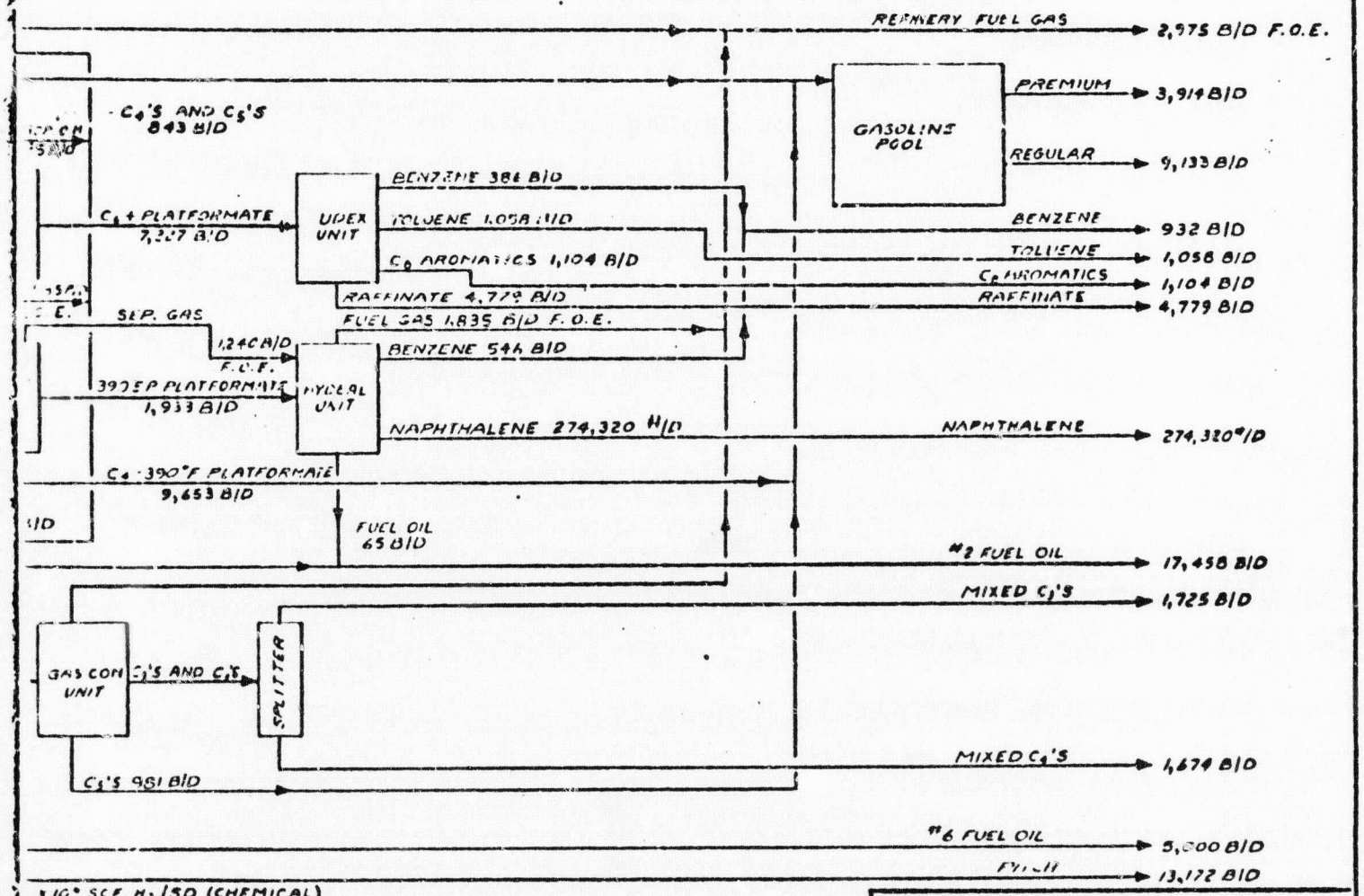

* 10⁶ SCF H_2/SD (CHEMICAL)

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UNIVERSAL OIL PRODUCTS COMPANY
30 ALGONQUIN ROAD DES PLAINES ILLINOIS U.S.A.

BLOCK FLOW DIAGRAM
OF
PROPOSED FUERTO RICO REFINERY
(ISOMAX CASE)

DR A.R.M. CK J.E.
APPR J.Y.U. DATE 4-17-62

DWG NO 76845-C-0 REV

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

ADDENDUM

ISOMAX CASE

An alternative scheme with respect to the base case considered in our study of April 13, 1962 is presented herewith.

The alternate case included the following changes with respect to the base case:

1. The Fluid Catalytic Cracking Process unit has been replaced by an Isomax Process unit.

2. A hydrogen manufacturing plant has been added to satisfy hydrogen requirements for the Isomax Process unit.

3. The aromatics producing facilities have been increased in size. Additional charge will be gasoline from the Isomax Process unit.

The same general statements and assumptions as presented in the base case apply to this alternate case.

Block flow diagram No. 76845-C shows the general processing scheme of the Isomax Case. The main considerations were to produce normal petroleum fuels that will meet general product specifications as well as producing petrochemicals.

Attached tables I through XXII show economic and technical information on this alternate case.

The scheme presented indicates a fairly good return of common equity. It is estimated that a 60,000 B/D refinery following this scheme can be built in Puerto Rico at a cost of about $68 million, including working capital and start-up expenses. This cost exceeds the base case cost by $11 million. However, the payouts in both cases are similar and the net earnings on equity in the Isomax Case are over $9 million above the base case in a 20-year period.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

ADDENDUM

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The alternate case offers the following additional advantages:

1) The Isomax Process is characterized by an inherent ability to process a widely diversified range of charging stocks. Included in the list are not only the virgin stocks varying in boiling range from kerosenes to heavy vacuum gas oils, but thermal and catalytic cycle stocks as well.

2) In addition to versatility as regards charging stock Isomax is a very flexible process. Never before have refiners had such control over maximizing gasoline production or conversely middle distillate production. This is particularly important in order to meet changing market demands.

3) Due to the flexibility of Isomax, product inventories can be reduced.

4) The naphtha produced in an Isomax unit is an excellent feedstock for Platforming to produce high grade gasoline and/or aromatics.

5) High quality middle distillates are produced with Isomax.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE I

ESTIMATED NET OPERATING INCOME

Year	Product Value	Charge Value	Gross Profit	Operating Expenses	Net Profit	Sinking Fund Debent.	Debent. Interest 6%	Income Before Depreci.	Depreci.	Balance Before Taxes	Income Taxes	Income After Taxes	Earnings on Equity 30%	Earnings on Equity 40%
1	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	3,247.3	12,797.6	3,131.7	9,665.9	-	9,665.9	6,996.5	10,046.2
2	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	3,122.9	12,962.0	3,131.7	9,830.3	-	9,830.3	7,092.9	10,225.6
3	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,998.6	13,156.3	3,131.7	9,991.6	-	9,996.6	7,215.2	10,395.9
4	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,774.2	13,350.7	3,131.7	10,159.0	-	10,159.0	7,332.6	10,571.1
5	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,629.8	13,455.1	3,131.7	10,323.4	-	10,323.4	7,451.9	10,743.7
6	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,465.5	13,619.4	3,131.7	10,487.7	-	10,487.7	7,570.3	10,914.9
7	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,301.1	13,783.8	3,131.7	10,652.1	-	10,652.1	7,689.7	11,086.6
8	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,136.8	13,948.1	3,131.7	10,816.4	-	10,816.4	7,807.0	11,255.7
9	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,972.4	14,112.5	3,131.7	10,980.8	-	10,980.8	7,926.4	11,427.1
10	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,808.0	14,276.9	3,131.7	11,145.2	-	11,145.2	8,045.8	11,598.5
11	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,643.7	14,441.2	3,057.0	11,384.2	4,170.6	7,213.6	4,628.2	7,213.6
12	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,479.3	14,605.6	3,057.0	11,548.6	4,211.0	7,337.6	4,708.5	7,337.6
13	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,314.9	14,770.0	3,057.0	11,711.0	4,291.4	7,421.6	4,762.5	7,421.6
14	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,150.6	14,934.3	3,057.0	11,877.3	4,351.5	7,525.8	4,829.1	7,525.8
15	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	986.2	15,098.7	3,057.0	12,041.7	4,412.2	7,629.5	4,895.7	7,629.5
16	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	821.8	15,263.1	927.0	14,336.1	5,253.4	9,082.7	6,344.3	9,082.7
17	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	657.5	15,427.4	927.0	14,500.4	5,313.8	9,186.6	6,415.2	9,186.6
18	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	493.1	15,591.8	927.0	14,664.8	5,376.2	9,288.6	6,489.2	9,288.6
19	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	328.7	15,756.2	927.0	14,829.2	5,435.5	9,393.7	6,562.2	9,393.7
20	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	164.4	15,920.5	927.0	14,993.5	5,497.0	9,496.5	6,639.1	9,496.5

Notes:

(a) Total capital investment $68,495,590
30% Equity Capital $13,697,118
6% Convertible Sinking Fund $54,798,472
Debentures, 6% interest, 20 years

(b) Yearly sinking fund, 1/20 of $54,798,472 = $2,739,424 paid at the end of each year out of income after taxes.

(c) Debenture interest, 6% on the unpaid debentures.

(d) Earnings on equity: Net income after payment of the yearly sinking fund. Gross income after payment of the yearly sinking fund plus depreciation.

(e) Depreciable items: Process and offsites facilities and startup capital.

(f) Depreciation rate: Process Capital-straight line on 15 years life 10% salvage value.
Offsite Capital-straight line on 20 years life 10% salvage value.

(g) Income Tax: No income tax due for 1st ten years. Thereafter, tax rate is 36.75% of taxable net income less $13,170.

(h) All numbers in thousands.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE II

ESTIMATED DIRECT OPERATING COST

	$/SD
1. Refinery Labor	
Including Maintenance, Safety, Warehouse and Utilities	6,868
2. Tetraethyl Lead	
Cost @ 0.25¢/cc T.E.L.	1,645
3. Maintenance - Offsites and Process	5,985
4. Laboratory and Miscl. Supplies	200
5. Catalyst	
(a) Isomax catalyst @ 30 bbls/lb per stage @ $1.60/Lb	1,517
(b) Platforming catalyst	
1. B-T-X Platformer - 50 bbl/lb	623
2. Hvy.Naph.Platformer - 55 bbl/lb @ $3.45/lb net replacement	839
(c) Unifining catalyst	
1. Naphtha Unifiner @ 200 bbl/lb @ $1.60/lb	126
2. Distillate Unifiner @ 200 bbl/lb @ $1.05/lb	62
(d) Hydeal catalyst @ 5 bbl/lb @ $1.00/lb	248
Total Catalyst	3,405
6. Chemicals and Inhibitor	
(a) Gasoline additives	
1. Sweetening agent 3 lbs/1000 bbls @ $1.00/lb	39
2. Corrosion inhibitor, 6 lbs/1000 bbls @ 39¢/lb	30
3. Metal inhibitor 1 lb/1000 bbls @ $1.00/lb	13

(contd.)

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE II

ESTIMATED DIRECT OPERATING COST

	$/SD
1. Refinery Labor	
Including Maintenance, Safety, Warehouse and Utilities	6,868
2. Tetraethyl Lead	
Cost @ 0.25¢/cc T.E.L.	1,645
3. Maintenance - Offsites and Process	5,935
4. Laboratory and Miscl. Supplies	200
5. Catalyst	
(a) Isomax catalyst @ 30 bbls/lb per stage @ $1.60/Lb	1,517
(b) Platforming catalyst	
1. B-T-X Platformer - 50 bbl/lb	623
2. Hvy.Naph.Platformer - 55 bbl/lb @ $3.45/lb net replacement	839
(c) Unifining catalyst	
1. Naphtha Unifiner @ 200 bbl/lb @ $1.60/lb	116
2. Distillate Unifiner @ 200 bbl/lb @ $1.05/lb	62
(d) Hydeal catalyst @ 5 bbl/lb @ $1.00/lb	248
Total Catalyst	3,405
6. Chemicals and Inhibitor	
(a) Gasoline additives	
1. Sweetening agent 3 lbs/1000 bbls @ $1.00/lb	39
2. Corrosion inhibitor, 6 lbs/1000 bbls @ 39¢/lb	30
3. Metal inhibitor 1 lb/1000 bbls @ $1.00/lb	13

(contd.)

TABLE II (contd.)

ESTIMATED DIRECT OPERATING COST

	$/SD
6. Chemicals and Inhibitor (contd.)	
(b) Corrosion inhibitor, ammonia, lime, amine, etc. @ 30¢/lb	42
(c) Water treating, $1.50 per day/1000 GPM Circ.	121
(d) Glycol @ 0.1 lb glycol/bbl of charge @ 17¢/lb	125
(e) Clay @ 0.5 lb clay/bbl of aromatics @ $30/ton	23
Total Chemicals	393
7. Royalties (Running Basis)	
(a) Isomax 5.5¢/bbl charge	782
(b) Platforming @ 5.5¢/bbl charge	1,234
(c) Unifining	
Naphtha Unifining - waiver	-
Distillate Unifining @ 1.5¢/bbl charge	178
(d) Hydeal @ 5% of naphthalen sale value and 0.5¢/gal benzene	797
(e) UDEX @ $250,000 amortized over 10 years	73
Total Royalties	3,064
8. Insurance	
Estimated @ 2.0% of process, offsites and inventories	3,678
9. Utilities	
Electricity @ 1.0¢/KWH	3,969
Fuel*	6,232
Cooling water @ 0.9¢/1000 gals once-through	770
Steam @ 55.0¢/1000 lb	2 033
Total Utilities	13,004
Total Direct Operating Cost	38,242

*Pitch used to supplement refinery gas.

TABLE II (contd.)

ESTIMATED DIRECT OPERATING COST

	$/SD
6. Chemicals and Inhibitor (contd.)	
(b) Corrosion inhibitor, ammonia, lime, amine, etc. @ 30¢/lb	42
(c) Water treating, $1.50 per day/1000 GPM Circ.	121
(d) Glycol @ 0.1 lb glycol/bbl of charge @ 17¢/lb	125
(e) Clay @ 0.5 lb clay/bbl of aromatics @ $30/ton	23
Total Chemicals	393
7. Royalties (Running Basis)	
(a) Isomax 5.5¢/bbl charge	782
(b) Platforming @ 5.5¢/bbl charge	1,234
(c) Unifining	
Naphtha Unifining - waiver	-
Distillate Unifining @ 1.5¢/bbl charge	178
(d) Hydeal @ 5% of naphthalen sale value and 0.5¢/gal benzene	797
(e) UDEX @ $250,000 amortized over 10 years	73
Total Royalties	3,064
8. Insurance	
Estimated @ 2.0% of process, offsites and inventories	3,678
9. Utilities	
Electricity @ 1.0¢/KWH	3,969
Fuel*	6,232
Cooling water @ 0.9¢/1000 gals once-through	770
Steam @ 55.0¢/1000 lb	2,033
Total Utilities	13,004
Total Direct Operating Cost	38,242

*Pitch used to supplement refinery gas.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE III

ESTIMATED UTILITIES

Electricity	KW
Crude, Vacuum and Stabilizer Units	575
Light Naphtha Unifining Unit	290
Heavy Naphtha Unifining Unit	405
Distillate Unifining Unit	800
B-T-X Platforming Unit	1,632
Heavy Naphtha Platforming Unit	1,985
UDEX Unit	390
Naphthalene Hydeal Unit	1,310
Isomax and Gas Concentration Units	5,660
Visbreaking Unit	550
Hydrogen Plant	450
Subtotal	14,047
Offsites and Miscellaneous	2,490
Total	16,537

Fuel	10^6 BTU/Hr
Crude, Vacuum and Stabilizer Units	-327
Light Naphtha Unifining Unit	- 31
Heavy Naphtha Unifining Unit	- 46
Distillate Unifining Unit	- 38
B-T-X Platforming Unit	-142
Heavy Naphtha Platforming Unit	-185
UDEX Unit	- 3
Naphthalene Hydeal Unit	- 94
Isomax and Gas Concentration Units	-170
Visbreaking Unit	-104
Hydrogen Plant	-450
Subtotal	-1,590
Boiler House	-166
Total	-1,756

BTU/Day required	42,140 x 10^6 BTU
BTU/Day from fuel gas	18,770 x 10^6 BTU
BTU/Day needed to be purchased	23,370 x 10^6 BTU

Therefore 3,720 B/D pitch used to supplement refinery fuel gas.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE III

ESTIMATED UTILITIES

Electricity	KW
Crude, Vacuum and Stabilizer Units	575
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Fuel	10^6 BTU/Hr
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B-T-X Platforming Unit	-142
Heavy Naphtha Platforming Unit	-185
UDEX Unit	- 3
Naphthalene Hydeal Unit	- 94
Isomax and Gas Concentration Units	-170
Visbreaking Unit	-104
Hydrogen Plant	-450
Subtotal	-1,590
Boiler House	-166
Total	-1,756

BTU/Day required	42,140 x 10^6 BTU
BTU/Day from fuel gas	18,720 x 10^6 BTU
BTU/Day needed to be purchased	23,420 x 10^6 BTU

Therefore 3,720 B/D pitch used to supplement refinery fuel gas.

TABLE III (contd.)

ESTIMATED UTILITIES

Page 2

Cooling Water	GPM
Crude, Vacuum and Stabilizer	10,850
Light Naphtha Unifining Unit	980
Heavy Naphtha Unifining Unit	1,450
Distillate Unifining Unit	1,790
B-T-X Platforming Unit	4,050
Heavy Naphtha Platforming Unit	6,090
UDEX Unit	6,600
Naphthalene Hydeal Unit	6,000
Isomax and Gas Concentration Units	4,700
Visbreaking Unit	4,300
Hydrogen Plant	12,500
Miscellaneous	100
Total	59,410

Steam	1,000 Lbs/Hr
Crude, Vacuum and Stabilizer	-39.0
Light Naphtha Unifining Unit	-
Heavy Naphtha Unifining Unit	-
Distillate Unifining Unit	-
B-T-X Platforming Unit	-
Heavy Naphtha Platforming Unit	-
UDEX Unit	-99.0
Naphthalene Hydeal Unit	- 1.6
Isomax and Gas Concentration Units	-
Visbreaking Unit	-
Hydrogen Plant	-
Miscellaneous	-14.4
Total	-154.0
Visbreaker Steam Generator	+19.0
Boiler House	+135.0
Total	+154.0

TABLE III (contd.)

ESTIMATED UTILITIES

Page 2

Cooling Water	GPM
Crude, Vacuum and Stabilizer	10,850
Light Naphtha Unifining Unit	980
Heavy Naphtha Unifining Unit	1,450
Distillate Unifining Unit	1,790
B-T-X Platforming Unit	4,050
Heavy Naphtha Platforming Unit	6,090
UDEX Unit	6,600
Naphthalene Hydeal Unit	6,000
Isomax and Gas Concentration Units	4,700
Visbreaking Unit	4,300
Hydrogen Plant	12,500
Miscellaneous	100
Total	59,410

Steam	1,000 Lbs/Hr
Crude, Vacuum and Stabilizer	-39.0
Light Naphtha Unifining Unit	-
Heavy Naphtha Unifining Unit	-
Distillate Unifining Unit	-
B-T-X Platforming Unit	-
Heavy Naphtha Platforming Unit	-
UDEX Unit	-99.0
Naphthalene Hydeal Unit	- 1.6
Isomax and Gas Concentration Units	-
Visbreaking Unit	-
Hydrogen Plant	-
Miscellaneous	-14.4
Total	-154.0
Visbreaker Steam Generator	+19.0
Boiler House	+135.0
Total	+154.0

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE IV

ESTIMATED PERSONNEL REQUIREMENTS

Management	Per Day*
Manager	1
Assistant Manager)	1
Process Superintendent)	
Chief Engineer)	1
Mech. Superintendent)	
Personnel Manager	1
Chief Chemist	1
Comptroller	1
With above:	
Secretaries	6
Total Management	12
Office	
General Accounting Manager)	1
Refinery Accounting Manager)	
Oil Accounting Manager	1
Material Accounting Manager	1
Accounting Clerks	2
Yield Accountant	1
Billing Clerk	1
Tanker Agent	1
Payroll Clerk	3
Shipping Clerk)	3
Purchasing Agent)	
Office Service:	
Receptionist/Telephone Operator	1
Stenographers and Typists	8
Total Office	23
Laboratory	
Chemists	6
Knock Tester	1
Podbielniak Operator	1
Technicians	11
Washers	3
Samples	4
Total	26

*5 day work week - 8 hours per day.

(contd.)

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE IV

ESTIMATED PERSONNEL REQUIREMENTS

Management	Per Day*
Manager	1
Assistant Manager)	1
Process Superintendent)	
Chief Engineer)	1
Mech. Superintendent)	
Personnel Manager	1
Chief Chemist	1
Comptroller	1
With above:	
Secretaries	6
Total Management	12
Office	
General Accounting Manager)	1
Refinery Accounting Manager)	
Oil Accounting Manager	1
Material Accounting Manager	1
Accounting Clerks	2
Yield Accountant	1
Billing Clerk	1
Tanker Agent	1
Payroll Clerk	3
Shipping Clerk)	3
Purchasing Agent)	
Office Service:	
Receptionist/Telephone Operator	1
Stenographers and Typists	8
Total Office	23
Laboratory	
Chemists	6
Knock Tester	1
Podbielniak Operator	1
Technicians	11
Washers	3
Samples	4
Total	26

*5 day work week - 8 hours per day.

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TABLE IV (contd.)

ESTIMATED PERSONNEL REQUIREMENTS

Page 2

	Per Day*
Safety	
Chief Safety Engineer	1
Assistant Chief Safety Engineer	1
Fireman and Safety Personnel	6
Total	8
Technical and Economics - Case I - Case II	
Technical Superintendent)	1
Economics Superintendent)	
Engineers	6
Secretary	1
Total	8
Warehouse	
Chief Storekeeper	1
Assistant	2
Clerks	2
Helpers	6
Total	11
First Aid	
Doctor	1
Medical Assistant	1
Nurses	3
Total	5
General Workers and Security	
Chief Watchman	1
Shift Watchman	19
Porters	4
Yardmen	4
Total	24

(contd.)

TABLE IV (contd.)

ESTIMATED PERSONNEL REQUIREMENTS

Page 2

	Per Day*
Safety	
Chief Safety Engineer	1
Assistant Chief Safety Engineer	1
Fireman and Safety Personnel	6
Total	8
Technical and Economics - Case I - Case II	
Technical Superintendent)	
Economics Superintendent)	1
Engineers	6
Secretary	1
Total	8
Warehouse	
Chief Storekeeper	1
Assistant	2
Clerks	2
Helpers	6
Total	11
First Aid	
Doctor	1
Medical Assistant	1
Nurses	3
Total	5
General Workers and Security	
Chief Watchman	1
Shift Watchman	15
Porters	4
Yardmen	4
Total	24

(contd.)

TABLE IV (contd.)

ESTIMATED PERSONNEL REQUIREMENTS

Page 3

Maintenance	Per Day*
Chief Mechanical Engineer	1
Chief Civil Engineer	1
Draftsmen	3
Mechanical Foreman	6
Pipefitters	3
Pipefitters Helpers	9
Welders	2
Welders Helpers	2
Machinists	4
Machinists Helpers	8
Pump Mechanics	3
Pump Mechanics Helpers	3
Boiler Makers	4
Boiler Makers Helpers	4
Chief Electrician	1
Electricians	3
Electrician Helpers	3
Instrument Men	6
Carpenters	2
Carpenters Helpers	2
Painters	2
Painters Helpers	2
Insulator	4
Bricklayers	1
Bricklayers Helpers	1
Mason	2
Mason Helpers	2
Truck Drivers	6
Garage Mechanics, etc.	6
Labor Foremen	2
Laborers	40
Total	138

Oil Movement	
Superintendent	1
Assistant Superintendent	1
Cargo Inspector	1
Pumpers	9
Pumpers Helpers	9
Gaugers	9
Dock Clerks	3
Pumpers	3
Pipe Fitters	4
Pipe Fitters Helpers	10
Truck Loaders	4
Truck Loaders Helpers	4
Oil Separator Operators	4
Total	62

(contd.)

TABLE IV (contd.)

ESTIMATED PERSONNEL REQUIREMENTS

Page 3

Maintenance	Per Day*
Chief Mechanical Engineer	1
Chief Civil Engineer	1
Draftsmen	3
Mechanical Foreman	6
Pipefitters	3
Pipefitters Helpers	9
Welders	2
Welders Helpers	2
Machinists	4
Machinists Helpers	8
Pump Mechanics	3
Pump Mechanics Helpers	3
Boiler Makers	4
Boiler Makers Helpers	4
Chief Electrician	1
Electricians	3
Electrician Helpers	3
Instrument Men	6
Carpenters	2
Carpenters Helpers	2
Painters	2
Painters Helpers	2
Insulator	4
Bricklayers	1
Bricklayers Helpers	1
Mason	2
Mason Helpers	2
Truck Drivers	6
Garage Mechanics, etc.	6
Labor Foremen	2
Laborers	40
Total	138

Oil Movement	
Superintendent	1
Assistant Superintendent	1
Cargo Inspector	1
Pumpers	9
Pumpers Helpers	9
Gaugers	9
Dock Clerks	3
Pumpers	3
Pipe Fitters	4
Pipe Fitters Helpers	10
Truck Loaders	4
Truck Loaders Helpers	4
Oil Separator Operators	4
Total	62

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TABLE IV (contd.) E 254

ESTIMATED PERSONNEL REQUIREMENTS

Page 4

Operations	Per Shift
Shift Foreman	1
Crude, Vacuum and Stabilizer	
Senior Operator	1
Board Man	1
Helper	2
Visbreaking Unit	
Senior Operator	1
Board Man	1
Helper	1
Naphtha Unifiner - BTX Platformer-UDEX	
Senior Operator	1
Board Man	2
Helper	3
Naphtha Unifiner - Platformer - Hydeal	
Senior Operator	1
Board Man	2
Helper	3
Distillate Unifiner	
Senior Operator	1
Helper	1
Isomax Hydrogen Plant and Gas Concentration	
Senior Operator	1
Board Man	1
Helper	2
Boiler House	
Senior Operator	1
Water Treating and Pumping	2
Treaters and Splitter	
Board Man	1
Helper	1
Total	31

TABLE IV (contd.)

ESTIMATED PERSONNEL REQUIREMENTS

Page 4

Operations	Per Shift
Shift Foreman	1
Crude, Vacuum and Stabilizer	
Senior Operator	1
Board Man	1
Helper	2
Visbreaking Unit	
Senior Operator	1
Board Man	1
Helper	1
Naphtha Unifiner - BTX Platformer-UDEX	
Senior Operator	1
Board Man	2
Helper	3
Naphtha Unifiner - Platformer - Hydeal	
Senior Operator	1
Board Man	2
Helper	3
Distillate Unifiner	
Senior Operator	1
Helper	1
Isomax, Hydrogen Plant and Gas Concentration	
Senior Operator	1
Board Man	1
Helper	2
Boiler House	
Senior Operator	1
Water Treating and Pumping	2
Treaters and Splitter	
Board Man	1
Helper	1
Total	31

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE V

ESTIMATED PERSONNEL REQUIREMENTS AND COSTS

	No.	$/SD
Management	12	642
Office	23	262
Laboratory	26	346
Safety	8	100
Technical and Economics	8	176
Warehouse	11	182
First Aid	5	63
General Workers and Security	24	300
Maintenance	138	1,800
Oil Movement	62	583
Operations	131	2,414
Total	448	6,868

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE V

ESTIMATED PERSONNEL REQUIREMENTS AND COSTS

	No.	$/SD
Management	12	642
Office	23	262
Laboratory	26	346
Safety	8	100
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Warehouse	11	182
First Aid	5	63
General Workers and Security	24	300
Maintenance	138	1,800
Oil Movement	62	583
Operations	131	2,414
Total	448	6,868

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VI

ESTIMATED PROCESS INVESTMENT

Process Units	Material and Labor Costs
1. Crude Unit Including desalter, full corrosion protection and stabilizer	$ 2,000,000
2. Vacuum Unit	1,200,000
3. Light Naphtha Unifining Unit	550,000
4. Heavy Naphtha Unifining Unit	700,000
5. Distillate Unifining Unit	1,200,000
6. B-T-X Platforming Unit	1,800,000
7. Heavy Naphtha Platforming Unit	2,250,000
8. UDEX Unit	1,850,000
9. Naphthalene Hydeal Unit	3,100,000
10. Isomax and Gas Concentration Unit	6,600,000
11. Visbreaking Unit	2,100,000
12. Hydrogen Plant	2,750,000
13. C_3/C_4 Merox Unit	60,000
Process Units - Total M and L	$26,160,000
Design, engineering, contractor's expense and overhead	5,340,000
Total	$31,500,000
Allowance for ocean freight, local freight, unloading and hauling to site	$ 2,300,000

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VI

ESTIMATED PROCESS INVESTMENT

Process Units	Material and Labor Costs
1. Crude Unit Including desalter, full corrosion protection and stabilizer	$ 2,000,000
2. Vacuum Unit	1,200,000
3. Light Naphtha Unifining Unit	550,000
4. Heavy Naphtha Unifining Unit	700,000
5. Distillate Unifining Unit	1,200,000
6. B-T-X Platforming Unit	1,800,000
7. Heavy Naphtha Platforming Unit	2,250,000
8. UDEX Unit	1,850,000
9. Naphthalene Hydeal Unit	3,100,000
10. Isomax and Gas Concentration Unit	6,600,000
11. Visbreaking Unit	2,100,000
12. Hydrogen Plant	2,750,000
13. C_3/C_4 Merox Unit	60,000
Process Units - Total M and L	$26,160,000
Design, engineering, contractor's expense and overhead	5,340,000
Total	$31,500,000
Allowance for ocean freight, local freight, unloading and hauling to site	$ 2,300,000

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE VII

ESTIMATED OFFSITES FACILITIES INVESTMENT

	Material and Labor
Utilities	
Steam generating system	
Water treating facilities	
Fresh water supply	
Refinery fuel system	
Cooling water system	
Electric power system	
Compressed air system	
	$ 3,100,000
Service Facilities	
T.E.L. blending	
Fire fighting equipment	
Refinery flare and blowdown system	
Oil separation and retention pond	
Sewer system	
Telephone system	
Fencing and gates	
Roads and parking areas	
Truck load racks	
	1,400,000
Buildings and Contents	800,000
Tankage and Accessories	
Tankage	
Tankage accessories	
Transfer pumps	
Yard piping	
	10,000,000
	$15,300,000
Design, engineering, contractor's expense and overhead	3,000,000
	$18,300,000
Allowance for ocean freight, local freight unloading and hauling	2,300,000

Not included in above estimates are the following:

Land
Docks and wharfs
Site preparation
Piling if required

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VII

ESTIMATED OFFSITES FACILITIES INVESTMENT

	Material and Labor
Utilities	
Steam generating system	
Water treating facilities	
Fresh water supply	
Refinery fuel system	
Cooling water system	
Electric power system	
Compressed air system	
	$ 3,100,000
Service Facilities	
T.E.L. blending	
Fire fighting equipment	
Refinery flare and blowdown system	
Oil separation and retention pond	
Sewer system	
Telephone system	
Fencing and gates	
Roads and parking areas	
Truck load racks	
	1,400,000
Buildings and Contents	800,000
Tankage and Accessories	
Tankage	
Tankage accessories	
Transfer pumps	
Yard piping	
	10,000,000
	$15,300,000
Design, engineering, contractor's expense and overhead	3,000,000
	$18,300,000
Allowance for ocean freight, local freight unloading and hauling	2,300,000

Not included in above estimates are the following:

- Land
- Docks and wharfs
- Site preparation
- Piling if required

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XI

ESTIMATED GROSS MANUFACTURING MARGIN

Products	B/D	$/Bbl	¢/Gal	$/D
Gasoline, Premium	3,914	4.979	11.86	19,488
Regular	9,133	4.626	11.02	42,268
Total	13,057			61,756
Benzene	932	12.60	30.00	11,743
Toluene	1,058	7.56	18.00	7,998
C8 Aromatics	1,104	6.30	15.00	6.955
Raffinate	4,779	4.041	9.62	19,276
Naphthalene (¢/Lb)	687	-	(5.0)	13,716
Mixed C3's	1,725	2.964	7.06	5,113
Mixed C4's	1,674	2.964	7.06	4,962
No. 2 Fuel Oil	17,458	3.430	8.17	59,881
No. 6 Fuel Oil	5,000	2.151	5.12	10,755
Pitch	13,172	1.800	4.29	23,710
Value of Production	60,646			225,865
Charge				
Crude	60,000	2.350	5.60	141,000
Cost of Raw Material				141,000
Gross Manufacturing Margin				84,865

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VIII

ESTIMATED INITIAL INVENTORY REQUIREMENTS

	Barrels	Dollars
1. Charge Stocks		
Crude, 20 day inventory	1,200,000	2,820,000
2. Products		
Gasoline		
Premium, 25 days inventory	97,850	487,200
Regular, 25 days inventory	228,330	1,056,700
Benzene, 30 days inventory	28,000	352,800
Toluene, 30 days inventory	31,700	239,700
C8 Aromatics, 30 days inventory	33,100	208,500
Raffinate, 25 days inventory	119,500	482,900
Naphthalene, 30 days inventory	20,500	411,500
Mixed C3's, 15 days inventory	25,900	76,800
Mixed C4's, 15 days inventory	25,100	74,400
No.2 Fuel Oil, 25 days inventory	125,000	428,700
No.6 Fuel Oil, 25 days inventory	329,300	708,300
Total	1,064,280	4,527,500
3. Catalyst Initial Loading and a Spare Loading	Pounds	
Isomax	540,600	865,000
Naphtha Unifiners	64,600	103,400
Distillate Unifiner	44,500	46,700
B-T-X Platformer	52,600	286,700
Hvy. Naphtha Platformer	108,500	857,300
Hydeal	125,600	125,600
Total	2,123,100	2,284,800
4. Spare Parts	-	1,250,000
Total		8,062,100

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE X

ESTIMATED TOTAL INVESTMENT

Initial Catalyst and Chemical Loading and Spare Parts	$ 3,534,600
Process Investment	35,500,000
Offsites Investment	20,600,000
Startup and Working Capital	
(a) Depreciable	746,850
(b) Non-depreciable	8,104,140
Total	$ 68,485,590

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE IX

ESTIMATED STARTUP AND WORKING CAPITAL

Section 1 - Startup Capital	
A. Labor - 60 days supervision	$ 267,200
30 days operating and training	72,400
B. Utilities - 30 days startup and training	407,250
Total Startup Capital to Depreciable Capitalization	$ 746,850
Section 2 - Working Capital	
A. Charge Stock - 20 days inventory	$ 2,820,000
B. Products - necessary inventory	4,527,500
C. Direct Operating Costs - 30 days	757,140
Total Working Capital to Non-Depreciable Capitalization	$ 8,104,640

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE IX

ESTIMATED STARTUP AND WORKING CAPITAL

Section 1 - Startup Capital

A.	Labor - 60 days supervision	$ 267,200
	30 days operating and training	72,400
B.	Utilities - 30 days startup and training	407,250
	Total Startup Capital to Depreciable Capitalization	$ 746,850

Section 2 - Working Capital

A.	Charge Stock - 20 days inventory	$ 2,820,000
B.	Products - necessary inventory	4,527,500
C.	Direct Operating Costs - 30 days	757,140
	Total Working Capital to Non-Depreciable Capitalization	$ 8,104,640

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VIII

ESTIMATED INITIAL INVENTORY REQUIREMENTS

	Barrels	Dollars
1. Charge Stocks		
— Crude, 20 day inventory	1,200,000	2,820,000.
2. Products		
Gasoline		
Premium, 25 days inventory	97,850	487,200
Regular, 25 days inventory	228,330	1,056,700
Benzene, 30 days inventory	28,000	352,800
Toluene, 30 days inventory	31,700	239,700
C8 Aromatics, 30 days inventory	33,100	208,500
Raffinate, 25 days inventory	119,500	482,900
Naphthalene, 30 days inventory	20,500	411,500
Mixed C3's, 15 days inventory	25,900	76,800
Mixed C4's, 15 days inventory	25,100	74,400
No.2 Fuel Oil, 25 days inventory	125,000	428,700
No.6 Fuel Oil, 25 days inventory	329,300	708,300
Total	1,064,280	4,527,500
3. Catalyst Initial Loading and a Spare Loading	Pounds	
Isomax	540,600	865,000
Naphtha Unifiners	64,600	103,400
Distillate Unifiner	44,500	46,700
B-T-X Platformer	52,600	286,700
Hvy. Naphtha Platformer	108,500	857,200
Hydeal	125,600	125,600
Total	2,123,100	2,284,600
4. Spare Parts	-	1,250,000
Total		8,062,100

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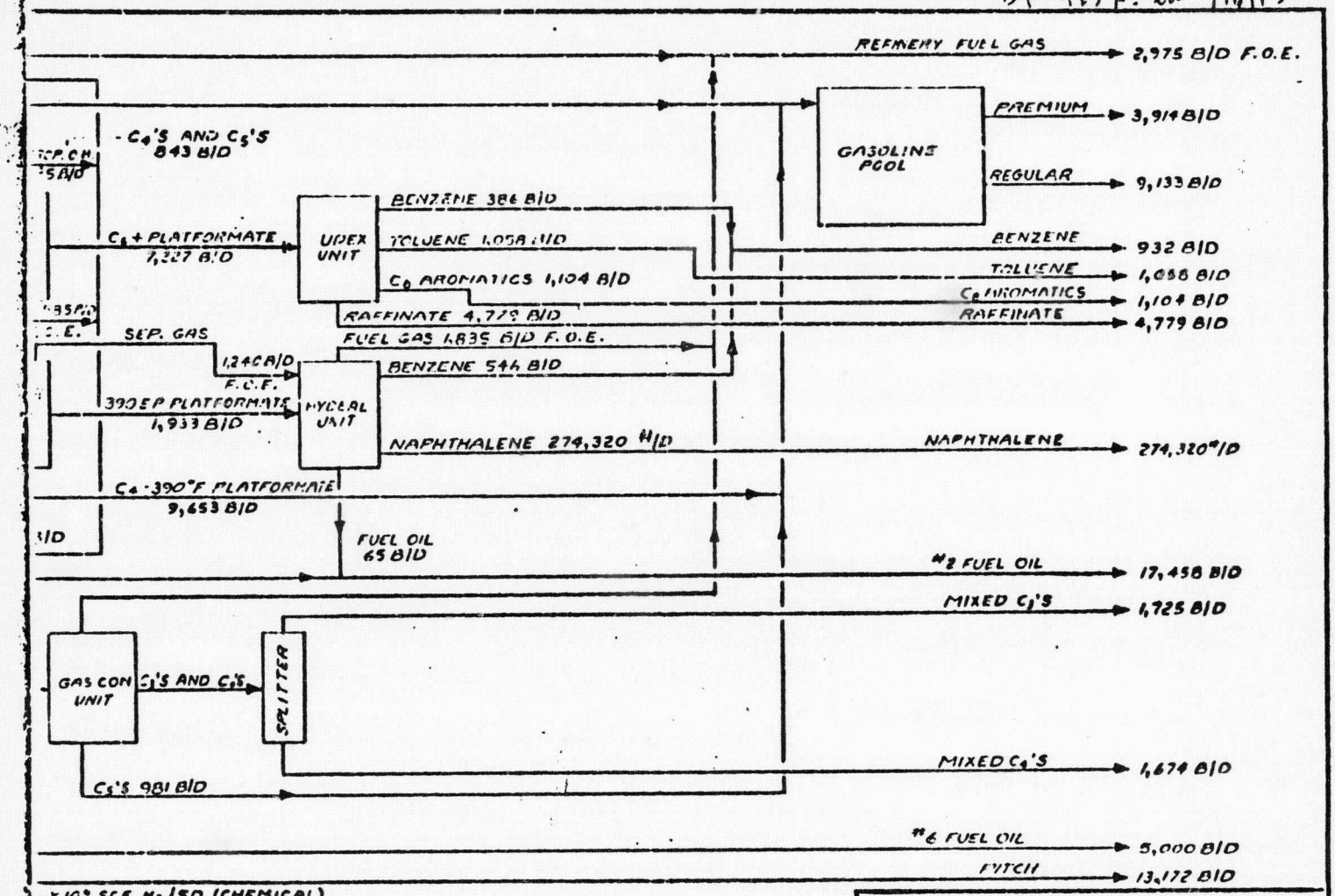

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UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD DES PLAINES ILLINOIS U.S.A.

BLOCK FLOW DIAGRAM
OF
PROPOSED PUERTO RICO REFINERY
(ISOMAX CASE)

DR B.R.M. CK. J.E.
APPR. J.Y.U. DATE 4-17-62

DWG NO. 76845-C-0 REV.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XII

ESTIMATED REFINERY CONSOLIDATED YIELDS

Charge	B/D	Vol.%	Lbs/Hr	Wt. %
Tia Juana Medium Crude	60,000	100.0	780,046	100.00
Refinery Yield				
1. Gasoline				
Lt.St.Run	3,404	5.7	30,243	3.88
C4-390°F Platformate	9,653	16.1	110,382	14.15
	13,057	21.8	140,625	18.03
2. Benzene	932	1.6	11,986	1.54
3. Toluene	1,058	1.8	13,250	1.70
4. C8 Aromatics	1,104	1.8	13,783	1.77
5. Raffinate	4,779	8.0	49,353	6.33
6. Naphthalene	687	1.1	11,430	1.47
7. Mixed C3's	1,725	2.9	12,938	1.66
8. Mixed C4's	1,674	2.8	14,386	1.84
9. No. 2 Fuel Oil	17,458	29.1	155,960	20.00
10. No. 6 Fuel Oil	5,000	8.3	79,145	10.15
11. Pitch*	13,172	22.0	212,631	27.23
12. Fuel Gas (F.O.E.)	2,975	5.0	64,558	8.28
	63,621	101.7	780,046	100.00

*Includes 3,720 B/D pitch used to supplement refinery fuel gas.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIII

ESTIMATED CRUDE UNIT YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lb/Gal
Tia Juana Medium Crude	27.1	60,000	100.0	780,000	100.0	7.429
Yields						
IBP - 165° F	-	2,040	3.4	17,706	2.27	-
165-270° F	62.0	5,100	8.5	54,288	6.96	6.087
270-450° F	45.4	7,680	12.8	89,544	11.48	6.660
450-650° F	38.6	11,880	19.8	143,988	18.46	6.926
650-1000° F	19.9	14,220	23.7	193,674	24.83	7.783
Vac. Bottoms	8.6	19,060	31.8	280,800	36.00	8.412
		60,000	100.0	780,000	100.00	

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIV

ESTIMATED VISBREAKING YIELD

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Vacuum Bottoms	8.6	19,080	100.0	280,800	100.0	8.412
Yields						
H_2S				618	0.22	
H_2				28	0.01	
C_1				899	0.32	
$C_2=$				365	0.13	
C_2				1,207	0.43	
$C_3=$		153	0.8	1,151	0.41	
C_3		210	1.1	1,488	0.53	
C_4		210	1.1	1,769	0.63	
iC_4		57	0.3	534	0.19	
nC_4		76	0.4	702	0.25	
C_5-400° F	56.0	1,755	9.2	19,319	6.88	6.283
Fuel Oil, 300 Cs @ 210° F	8.6	17,172	90.0	252,720	90.00	8.412
		19,633	102.9	280,800	100.00	

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XV

ESTIMATED ISOMAX YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Vacuum Gas Oil	19.9	14,220	100.0	193,680	100.0	7.783
H_2 (Chemical)				6,585	3.4	
				200,265	103.4	
Yields						
H_2S				2,905	1.5	
C_1				1,162	0.6	
C_2				1,162	0.6	
C_3				3,680	1.9	
C_4		1,095	7.7	9,103	4.7	
C_5/C_6		1,962	13.8	19,174	9.9	
C_7/400° F		6,939	48.8	80,377	41.5	
400-625° F	33	6,513	45.8	82,702	42.7	
Total		16,509	116.1	200,265	103.4	

Properties of Products

	C_5/C_6	C_7-400° F
F-1 Octane, Clear	80	56
+3cc.	97	79

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVI

ESTIMATED B-T-X PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Unifined Virgin 165-270° F	62.0	5,100	56.54	54,273	56.57	6.087
Unifined Visbkr. 165-270° F	63.4	810	8.98	8,568	8.93	6.044
Light Isomaxate	62.0	3,100	34.48	33,090	34.50	6.087
		9,020	100.00	95,931	100.00	
Yields						
H_2				1,477	1.54	
C_1				259	0.27	
C_2				1,180	1.23	
C_3		372	4.12	2,753	2.87	
C_4's		537	5.95	4,451	4.64	
C_5's		494	5.48	4,451	4.64	
C_6 Paraffins		1,254	13.90	11,953	12.46	
C_7 Paraffins		1,214	13.46	11,991	12.50	
C_8 Paraffins		941	10.43	9,555	9.96	
C_9 Paraffins		327	3.63	3,386	3.53	
Methyl Cyclopentane		184	2.04	1,995	2.08	
Cyclohexane		26	0.29	297	0.31	
C_7 Naphthene		105	1.16	1,161	1.21	
C_8 Naphthenes		44	0.49	499	0.52	
C_9 Naphthenes		26	0.29	288	0.30	
Benzene		390	4.32	4,950	5.16	
Toluene		1,102	12.22	13,805	14.39	
C_8 Aromatics		1,227	13.60	15,312	15.96	
C_9+ Aromatics		487	5.40	6,168	6.43	
		8,730	96.78	95,931	100.00	

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVII
ESTIMATED UDEX YIELDS

Charge

Depentanized Platformate - See Table Estimated B-T-X Platforming Yields

Yields

Extract

Platforming Yields, B/D		Recovery Factors	Recovered
Benzene	390	99%	386
Toluene	1,102	96%	1,058
C8 Aromatics	1,227	90%	1,104

Raffinate

C6 Paraffins	1,254
C7 Paraffins	1,214
C8 Paraffins	941
C9+ Paraffins	327
Methyl Cyclopentane	184
Cyclohexane	26
C7 Naphthenes	105
C8 Naphthenes	44
C9 Naphthenes	26
Benzene	4
Toluene	44
C8 Aromatics	123
C9+ Aromatics	487

General Properties of Raffinate

F-1 Clear	62.0
F-1 +3cc.	80.0
RVP	3.5

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVIII

ESTIMATED HEAVY NAPHTHA PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Unifined Virgin 270-450° F	45.4	7,680	57.21	89,507	57.30	6.660
Unifined Visbrkr. 270-400° F	50.2	945	7.04	10,759	6.89	6.433
Heavy Isomaxate	45.4	4,800	35.75	55,942	35.81	6.660
	45.8	13,425	100.00	156,208	100.00	

Yields

H_2			1,968	1.26
C_1			3,452	2.21
C_2			4,421	2.83
C_3			5,967	3.82
C_4's	772	5.75	6,483	4.15
C_5's	765	5.70	7,014	4.49
Hexanes+	10,341	77.03	126,903	81.24
	11,878	88.48	156,208	100.00

Deprop. Bottoms - C_4+ Platformate

	B/D	°API	RVP	F-1 Cl.	F-1+3cc.
Total Bottoms	11,586	42.1	6.07	94.9	99.8

Platformate Split

	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
C_4-390° F Platf.	43.8	9,653	83.3	110,384	80.23	6.534
390 E.P. Platf.	15.0	1,933	16.7	27,205	19.77	8.044
	42.1	11,586	100.0	137,589	100.00	6.788

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIX

ESTIMATED NAPHTHALENE HYDEAL YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lb/Gal
Hvy. Platformate	15.0	1,933	100.0	27,205	100.0	8.044
H_2(710 SCF/100#)	-	-	-	1,027	3.78	-
				28,232	103.78	
Yields						
Benzene	28.3	546	28.3	7,074	26.00	7.375
Naphthalenes				11,430	42.00	
Hvy. Aromatics	31.0	65	3.3	817	3.00	7.251
Fuel Gas(methane)				8,918	32.78	
				26,239	100.00	

Fuel Gas*- 1,840 bbl F.O.E.

*Fuel gas containes components both from Hydeal operations and the heavy naphtha Platformer separator gas.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XX

ESTIMATED GAS CONCENTRATION UNIT YIELDS

	Crude Lbs/Hr	Hvy.Nap. Platf. Lbs/Hr	B-T-X Platf. Lbs/Hr	ISOMAX Lbs/Hr	Visbkr. Lbs/Hr	Total Lbs/Hr	Fuel Gas Lbs/Hr	BTU/Lb	Recovered Lbs/Hr	Recovered BPD
H_2	-	37	23	-	28	88	88	61,029	-	
C_1	-	401	27	1,162	899	2,489	2,489	23,886	-	
$C_2^=$	-	-	-	-	365	365	365	21,639	-	
C_2	-	1,802	440	1,162	1,207	4,611	4,611	22,325	-	
$C_3^=$	-	-	-	-	1,151	1,151	173	21,047	978	128
C3	2,890	4,038	1,831	3,680	1,488	13,927	2,089	21,664	11,838	1,597
$C_4^=$	-	-	-	-	1,769	1,769	35	20,766	1,734	196
iC_4	222	313	343	5,917	534	7,329	11	21,239	7,318	890
nC_4	510	383	238	3,186	702	5,019	14	21,301	5,005	588
	3,622	6,974	2,902	15,107	8,143	36,748	9,875		26,873	3,399

Recovery Factors

C_3's 85%
C_4's 98%

Fuel Gas: 860 bbl F.O.E.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XXI

ESTIMATED GASOLINE POOL

Components	B/D	Vol. %	F-1 Cl.	F-1+3cc	RVP
Lt. St. Run	3,404	26.1	78.5	96.0	25.00
C4-390° F Platformate	9,653	73.9	92.5	98.6	5.50
	13,057	100.0	88.4	98.0	10.0

T.E.L. requirement to meet pool octane of 95.7 = 1.2cc T.E.L./Gal

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XXII

ESTIMATED H_2 PRODUCTION AND CONSUMPTION

Production

B-T-X Platformer	9,020 B/D	x 729 SCF/Bbl	=	6.6 x 10^6SCF/D
Hvy. Nap. Platformer	13,380 B/D	x 647 SCF/Bbl	=	8.7 x 10^6SCF/D
Hydrogen Plant			=	30.0 x 10^6SCF/D
				45.3 x 10^6SCF/D

Consumption*

Lt.Nap.Unifiner	5,910 B/D	x 108 SCF/Bbl	=	0.6 x 10^6SCF/D
Hvy.Nap.Unifiner	8,580 B/D	x 117 SCF/Bbl	=	1.0 x 10^6SCF/D
No.2 F.O.Unifiner	11,880 B/D	x 126 SCF/Bbl	=	1.5 x 10^6SCF/D
Hydeal Unit	1,933 B/D	x 4498 SCF/Bbl	=	8.7 x 10^6SCF/D
Isomax Unit	14,220 B/D	x 2150 SCF/Bbl	=	30.6 X 10^6SCF/D
				42.4 x 10^6SCF/D

*Consumption includes chemical and solution losses.

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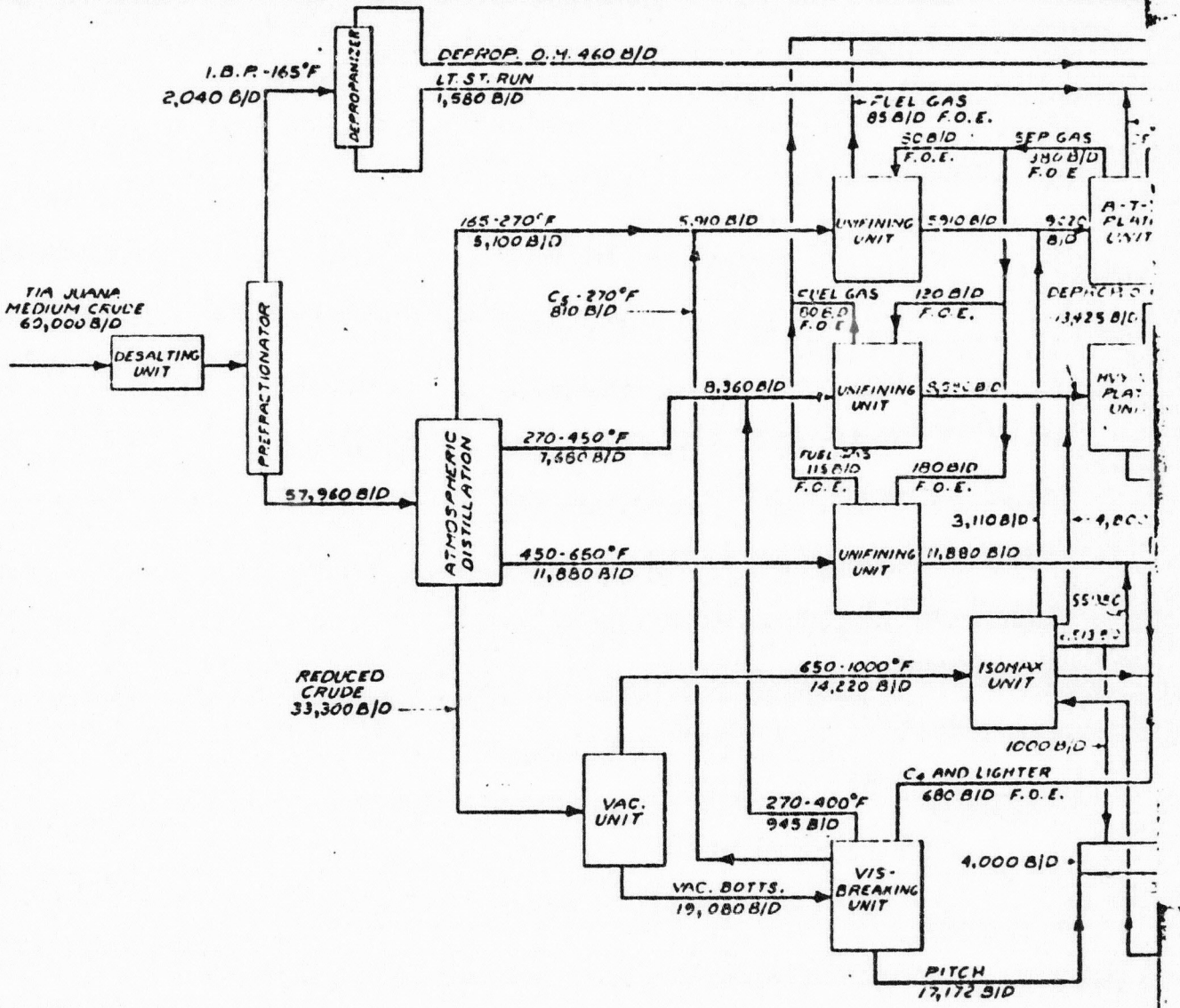

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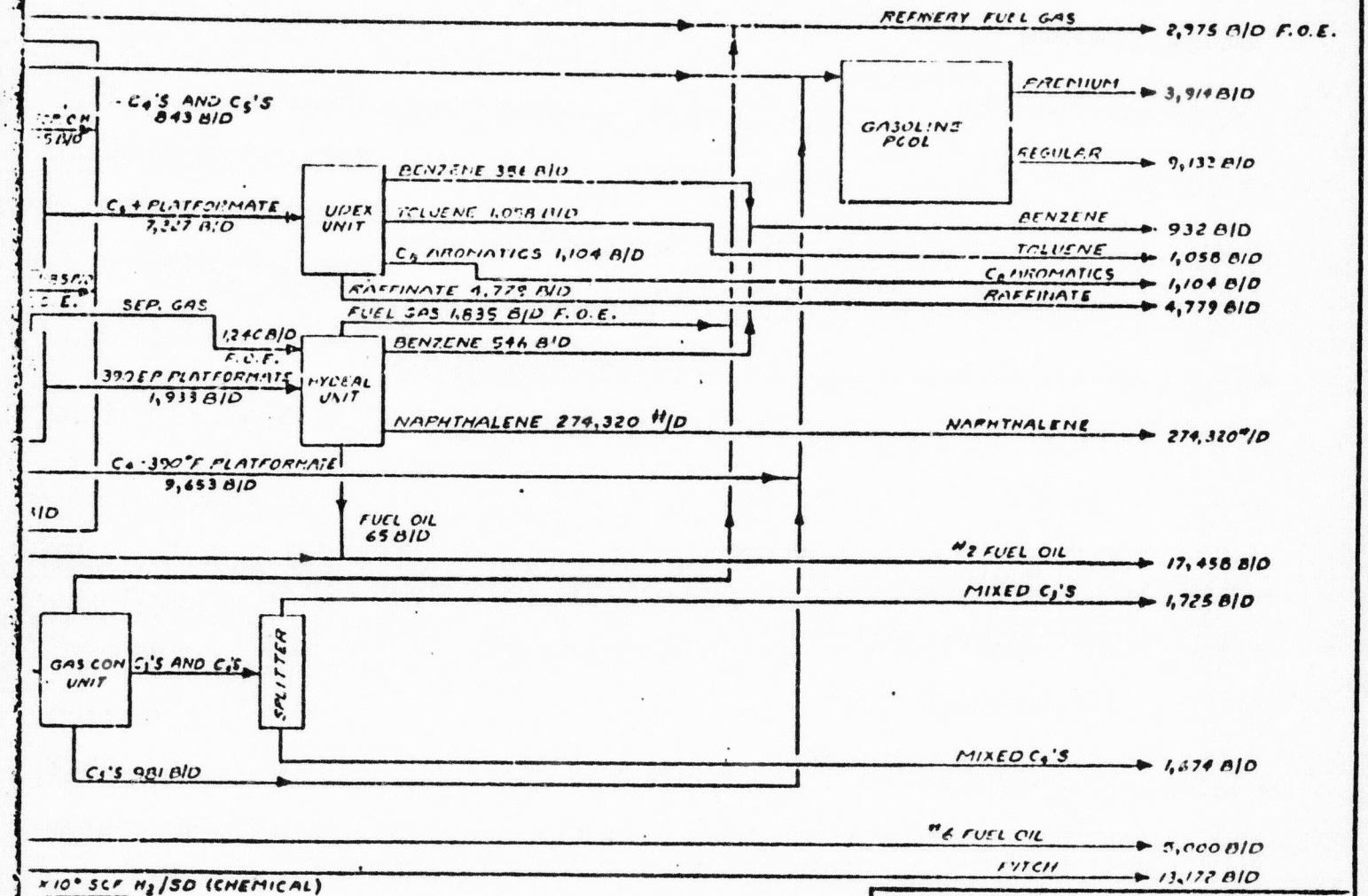

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UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD DES PLAINES ILLINOIS U.S.A.

BLOCK FLOW DIAGRAM
OF
PROPOSED PUERTO RICO REFINERY
(ISOMAX CASE)

DR B.R.M. CK J.E. DWG NO 76845-C-0 REV

APPR J.Y.N. DATE 4-17-82

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

APRIL, 1962

ADDENDUM

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

LIST OF TABLES AND DRAWINGS

Table I	Estimated Net Operating Income
Table II	Estimated Direct Operating Cost
Table III	Estimated Utilities
Table IV	Estimated Personnel Requirements
Table V	Estimated Personnel Requirements and Costs
Table VI	Estimated Process Investment
Table VII	Estimated Offsites Facilities Investment
Table VIII	Estimated Initial Inventory Requirements
Table IX	Estimated Startup and Working Capital
Table X	Estimated Total Investment
Table XI	Estimated Gross Manufacturing Margin
Table XII	Estimated Refinery Consolidated Yields
Table XIII	Estimated Crude and Vacuum Unit Yields
Table XIV	Estimated Visbreaking Yields
Table XV	Estimated B-T-X Platforming Yields
Table XVI	Estimated UDEX Yields
Table XVII	Estimated Heavy Naphtha Platforming Yields
Table XVIII	Estimated Naphthalene Hydeal Yields
Table XIX	Estimated Isomax Yields
Table XX	Estimated Gas Concentration Unit Yields
Table XXI	Estimated Gasoline Pool
Table XXII	Estimated H_2 Production and Consumption
Drawing No. 76845-C-Rev.0	Block Flow Diagram of Normal Refinery Fuels and Petrochemicals.

The alternate case offers the following additional advantages:

1) The Isomax Process is characterized by an inherent ability to process a widely diversified range of charging stocks. Included in the list are not only the virgin stocks varying in boiling range from kerosenes to heavy vacuum gas oils, but thermal and catalytic cycle stocks as well.

2) In addition to versatility as regards charging stock Isomax is a very flexible process. Never before have refiners had such control over maximizing gasoline production or conversely middle distillate production. This is particularly important in order to meet changing market demands.

3) Due to the flexibility of Isomax, product inventories can be reduced.

4) The naphtha produced in an Isomax unit is an excellent feedstock for Platforming to produce high grade gasoline and/or aromatics.

5) High quality middle distillates are produced with Isomax.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

APRIL, 1962

ADDENDUM

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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Table XXII	Estimated H_2 Production and Consumption
Drawing No. 76845-C-Rev.0	Block Flow Diagram of Normal Refinery Fuels and Petrochemicals.

J-26, Fischbeck Memorandum, March 7, 1962

c: Paul J. Parker
Miller W. Cox
A. D. Fischbeck

For F.D. J-26
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(NEA)

MEMORANDUM

Refinery - Puerto Rico
ADF-63NY-62

On March 7, 1962, Mr. John H. Gibbs, whose card reads: Petrochemicals, 1422/27 Louis Towers Building, Philadelphia, Pennsylvania - Telephone: 57264, New York LE 2-2929, came to my office unannounced to let us know that an undisclosed group had under way a proposal to construct a 100,000 bbl/day refinery in Puerto Rico. During our brief discussion, I informed him that we were interested in exploring the possibilities that may be offered to Phillips under such an undertaking.

Later in the afternoon, Mr. Gibbs, accompanied by Mr. J. P. Coan, whose card reads: Onega Management, 230 Park Avenue, New York, N. Y., returned to my office for further discussions. In this meeting, Mr. Coan intimated that consideration was being given to including in the ownership such companies as Murphy Petroleum Company, Celanese, Texas Company and Cities Service and that preliminary overtures had been made to Monsanto and Union Carbide. However, Mr. Coan stated that consideration of the above-named companies was in the formative stage and that no semi-definite commitment had been given to any of them, excepting perhaps the Murphy group.

In the course of our conversation, Mr. Coan mentioned that the project would probably be resolved by installing a 50 to 60 thousand bbl/day refinery which could supply feedstocks for the production of a multiplicity of petrochemicals. The matter relating to the ownership of the wide scope petrochemical projects envisioned and the refinery proper had not been resolved. He gave the impression of favoring the refinery producing feedstocks which then would be sold to other entities who wished to participate in petrochemical manufacture. However, the ensuing conversation revealed that he did not have definite ideas on ownership disposition and probably would be agreeable to having one company engaging in all of the various activities that could be economically justified. I suggested that the number of participating companies be held to a minimum and that crude oil purchases be in proportion to percentage ownership.

It was intimated that our government, through the Economic Development Administration, were encouraging the proposed project in Puerto Rico as a means of enhancing the Puerto Rican economy and to improve the Puerto Rican standard of living with the objective being to make the island a showplace in comparison to Cuba.

Messrs. Gibbs and Coan mentioned Oscar Chapman, former Secretary of the [illegible] Department, government officials, as being identified

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with the proposed undertaking. On March 14, Mr. Gibbs called from Philadelphia and asked to arrange a meeting before the end of the week to further our discussions. We tentatively set a meeting for Friday afternoon for this purpose. On March 15, Mr. Coan called to state that he had just returned from New Orleans where meetings had taken place with Mr. Bruce Brown. According to Mr. Coan, Mr. Brown has graciously accepted the responsibility of acting as Chairman of the Board of the new company. In addition, he reported that RFC had agreed that 1/3 of the common stock as equity could be made available to the participating companies. It was inferred that Puerto Rico would own controlling interest. Mr. Brown will arrive in New York on Saturday, March 17, at 12:30 P.M. Mr. Coan invited me to attend, along with other Phillips representatives available at that time, a luncheon which has been tentatively scheduled at 2:00 P.M. on Saturday. The exact time has not been ascertained but we will be informed later.

My discussions have all been predicated on the basis that we are interested in investigating possibilities of the type these gentlemen brought to my attention. However, any representation of interest and efforts directed towards being considered as a participating shareholder were wholly subject to Management's approval.

EDF:RP

A. D. Fischbeck

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J-27, Letter, Fischbeck to Coan, March 9, 1962

PHILLIPS PETROLEUM COMPANY
NEW YORK 5, N. Y.
80 BROADWAY PHONE DIGBY 4-2480 CABLE PHILPETE - NEW YORK

INTERNATIONAL DEPARTMENT
SALES AND DEVELOPMENT DIVISION
PETROCHEMICAL PROJECTS DEVELOPMENT

J-27

E 289

March 9, 1962

Mr. J. P. Coan
Omega Management Inc.
230 Park Avenue
New York 17, N. Y.

Dear Mr. Coan:

I will be looking forward to resuming our exploratory discussions upon your return from New Orleans during the week beginning March 11.

We are interested in examining the possibilities of supplying crude oil, participating in the refining and petrochemical complex, supplying management, providing technical assistance, participating in product sales and in any other category befitting our abilities.

My management has been informed of the project in the brief, general, non-committal manner as presented to me. Subject to my management's approval of any understandings we may reach, our discussions may proceed at your convenience.

Sincerely yours,

A. D. Fischbeck, Manager
Petrochemical Projects Development

ADF:RP

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J-28, Fischbeck Memorandum, March 27, 1962

cc: Paul J. Parl
C. C. Tate
Miller Conn (r) I. L. Coffman
A. D. Fischbeck

E 290

MEMORANDUM

March 27, 1962

Puerto Rico
DF-47-62

The proposed Puerto Rican refining-petrochemical project was the subject of a meeting during the afternoon of March 16, 1962. In attendance were the following:

1. Mr. Bruce Brown, Director of Murphy Oil Company
and
Independent Consultant
New Orleans, Louisiana

2. Mr. J. P. Coan Omega Management, Inc.
230 Park Avenue
New York 17, New York

3. Mr. Richard Fleming, Assistant Director
Research and Engineering Dept.
Sun Oil Company
Philadelphia, Pennsylvania

4. Dr. Aimison Jonnard, Vice President of Planning (& a director)
Celanese Chemical Company
A Division of Celanese Corp. of America
522 Fifth Avenue
New York, New York

5. Mr. A. D. Fischbeck, International Department
Phillips Petroleum Company
New York, New York

In the course of this meeting it was announced that Mr. Brown had consented to be Chairman of the Board of the proposed company; Mr. Oscar Chapman's law firm would be retained to supply the necessary legal counsel. Retaining Mr. Chapman's firm was stated to require an initial fee of $6,000 and a monthly fee of $1,000.

As a general plan of a corporate structure, Mr. Brown proposed the following:

Equity

52% owned by the general public of Puerto Rico
32% owned by participating companies
15% set aside for management stock options and management usage
1% set aside for Omega management, Inc. as a promoters fee

(In case 52% of the equity is not fully subscribed by Puerto Ricans the participating companies can increase participation proportionally)

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Board of Directors

Chairman: Mr. Bruce Brown

Directors: 3 Puerto Rican Nationals
Mr. Oscar Chapman
Mr. Carlisle, Executive Vice President
Day & Zimmerman Engineering Company
Philadelphia, Pennsylvania
Mr. David Graham (provided Hornblower and Weeks act as underwriter)

Each participating company can nominate one member for the board.

Finance

Interim financing is expected to stem from the participating companies. The estimated amount was not mentioned.

Taxes

Corporate income tax will be forgiven for a firm period of ten years and a possibility exists that the term can be extended to thirteen years.

In the discussions it was inferred by Mr. Brown that our Economic Development Administration in Washington was working closely on the proposed project with its branch office in Puerto Rico and with the Puerto Rico Industrial Development Corporation. It was also stated that PRIDC, if necessary, can build the plant and lease back to an operating company. PRIDC, as a minimum, can assist with site purchase through condemnation procedures. Plant sites adjacent to suitable locations are valued at approximately $20,000 per acre.

Only scanty information was given pertaining to what was available for the various oil companies that had been considered. According to Mr. Brown, Murphy Oil Company wanted 5,000 B/D of petroleum products for East Coast distribution; Sun Oil Company takes about 6,000 B/D from Commonwealth and probably would wish to have an equal or greater volume from the proposed project. It was thought that Phillips could consider taking about 10,000 B/D.

Since a study had been made by U.O.P. for the project, I stated that we would appreciate the opportunity to examine the study with the view in mind of making an independent proposal if interest in the project was expressed in Bartlesville. On March 26 I received the U.O.P. study which is available for use. Omega Management placed a tentative deadline of April 1 for our study. Obviously it is impossible to meet this date.

My impression is that an additional crude oil import allocation is being sought by capable promoters under the guise or justification of a petrochemical complex which will decrease in significance as soon as the import license and refinery is assured. The refining capacity has now been set at 60,000 B/D.

Dale Fischbeck

ADF/djs

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J-29, Letter, Coan to Fischbeck, March 22, 1962

J-29

OMEGA MANAGEMENT
INCORPORATED
230 PARK AVENUE • NEW YORK 17, N. Y.
LEXINGTON 2-2929

P R-1c
E 292

March 22, 1962

Rec'd 3-26-62

Mr. A. D. Fischbeck, Manager
Projects Development
Phillips Petroleum Company
464 Adams Building
Bartlesville, Oklahoma

File: Puerto Rico - Petroleum - General

Dear Mr. Fischbeck:

It was good to talk with you yesterday. I appreciate your expression of interest in the project.

The theoretical work done for us by Universal Oil Products is attached. The name of the company as shown in the data will be changed, and we will inform you of the change as soon as it has been approved by the Economic Development Administration.

In Washington Tuesday it was decided to apply to the Department of the Interior for a 60,000 barrel per da, allocation on the basis that was described in our Saturday meeting. I would be pleased to receive from you the economics of the proposed complex as you would prepare such a study if Phillips were in a position to secure the allocation. We will ask other participants to provide the same information, and will make use of as much of the data as Mr. Chapman deems necessary within the time schedule under which we are working.

I think you should know that failure to meet the time schedule would not influence the basis on which the project has been set up. Expedition, however, might favorably influence the distribution of the available equity, as discussed.

Again, many thanks for your time and interest.

Best regards,

J. P. Coan

JPC:ks
Enclosure

J-30, Letter, Fischbeck to Coan, April 2, 1962

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E 293

PHILLIPS PETROLEUM COMPANY
NEW YORK 5, N. Y.
80 BROADWAY PHONE DIGBY 4-3480 CABLE PHILPETE - NEW YORK

INTERNATIONAL DEPARTMENT
SALES AND DEVELOPMENT DIVISION
PETROCHEMICAL PROJECTS DEVELOPMENT

April 2, 1962

Puerto Rico
ADF-69NY-62

Mr. J. P. Coan
Omega Management, Inc.
230 Park Avenue
New York 17, N. Y.

Dear Mr. Coan:

We appreciate being given the opportunity to study the project proposed for Puerto Rico. You are to be complimented on the study completed and efforts directed towards bringing this project to fruition.

Although time available did not permit a thorough study or preparation of a proposal setting forth our views, we did review the data prepared by U.O.P. together with the preliminary corporate structure plan supplied in our meeting on March 16, 1962. Our preliminary conclusions were as follows:

1. Phillips is not seeking to participate in the production of petrochemicals in Puerto Rico since we have large integrated operations on the Gulf Coast.

2. The advantages of participating in a refining project as set forth in our meeting of March 16 are not readily apparent.

In order not to impede your work with others, the data supplied is being returned herewith. Our thanks to you and your associates for thinking of Phillips. As the formative steps are taken, many facets of the proposed undertaking will be resolved into a concise pattern that perhaps would have a bearing on our thinking at a later date.

Yours very truly,

A. D. Fischbeck, Manager
Petrochemical Projects Development

ADF:RP
Attachment

EXH. NO. 145
DORAK REPORTER

5/23/72

L62

J-31, Letter, Brown to Hewitt, May 16, 1962

BRUCE K. BROWN
1410 OIL AND GAS BUILDING
NEW ORLEANS 12, LOUISIANA

TELEPHONE
529-1566

E 294

May 16, 1962

Phillips Petroleum Company
708 Phillips Bldg.
Bartlesville, Okla.

PX-21
F-2-D
2-9-72 WA

Attention: Mr. W. C. Hewitt

Gentlemen:

Attached is a memorandum (seven pages) concerning "a new petrochemical complex for Puerto Rico." This matter was called to my attention in December 1961 by Mr. Oscar L. Chapman of Pennsylvania Building, Washington, D. C. Mr. Chapman had been asked by a group of promoters to assist them in such a project by becoming general counsel of a company to be formed and negotiating an oil import quota. I told him (1) that I did not want to accept a retainer from the group, (2) that I did not care to become involved unless my client, Murphy Corporation, could have a participation and (3) that I would be willing to advise him on the matter.

The original group never did get together and Mr. Chapman severed his connection with them. However, he and I have continued to work with Mr. John P. Coan, President of Omega Management, Inc. of 230 Park Avenue, New York. While lacking any familiarity with the details of the oil business, Mr. Coan is a reputable business consultant whose clients include Celanese, Corn Products, Day and Zimmerman and others. As of late January, Mr. Coan said he had personally expended about $10,000.00 out-of-pocket; this expenditure including the cost of a Puerto Rican corporation (now abandoned), an engineering study by U. O. P., travel to Puerto Rico, etc. Mr. Coan's significance in the picture is that he has done all of the work with the Puerto Rican Economic Development Administration.

It appears to me that a new Puerto Rican refinery project including an actual petrochemical operation (such as the production of polyolefins) as an integral part might have some chance of securing an oil import quota in Washington even though the proclamation and regulations would have to be revised to permit it. Since Phillips

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is both a refiner-marketer and a petrochemical manufacturer, it might have a dual interest in such a project. If I have judged the situation correctly, the commitment to make petrochemicals is a necessary preliminary to an approach to government for quota relief and if quota relief is afforded, the rest of the project--back-to-back contracts with producer-marketers and finance--would be very easy to accomplish. If, on the other hand, quota relief is denied, little is lost.

Phillips might enter the project as a producer-marketer insofar as the basic refinery is concerned and separately as an independent polyolefin manufacturer; drawing olefins from the refinery, making its own plant investment and not in any way sharing the polyolefin profit with others. On the other hand, the polyolefin plant might be built, under Phillips license, as an integral part of the whole project and financed as such by the whole group with Phillips setting the terms under which it would manage the polyolefin plant and dispose of the product. Presumably, a well-organized project would not require an equity investment of more than 25-30% of the total cost.

In closing, let me make clear that I am in no sense a broker in this matter and expect no fee from Phillips under any circumstances.

Very truly yours,

(Sgd.) Bruce K. Brown

BKB:ag

Encl.

J-32, Memorandum of Brown to Phillips, May 16, 1962

General Considerations

An opportunity may exist to build a new petroleum refinery in Puerto Rico but it would have to be justified as a producer of petrochemical raw materials to support new chemical plants to be built as a part of or adjacent to the refinery.

Petroleum Refining in Puerto Rico

Puerto Rico has no indigenous production of natural gas or crude petroleum. Hydrocarbon raw materials for the production of chemicals and plastics must thus be derived solely from petroleum refining operations on the island. Two refineries are now operating in Puerto Rico. Commonwealth Oil Refining Company ("CORCO"), which is publicly owned, operates a 75,000 b/d refinery at Ponce. A smaller refinery, located near San Juan, has a capacity of about 20-25,000 b/d. It is known as Caribe Refining Company. While the operation has been managed by Pontiac Refining Company executives, it has just been announced that Gulf is acquiring 100% ownership. The trade press indicates that Caribe plans to increase crude run by 15,000 b/d but there is a considerable question as to whether a license to import more crude oil can be obtained. Puerto Rico's refineries utilize crude oil imported from Venezuela under import license allocations made by the Oil Imports Administration which is a part of the United States Department of Interior.

Petrochemical Operations in Puerto Rico

A petrochemical complex has been developing around the CORCO refinery. Carbide's Puerto Rican subsidiary, Union Carbide Caribe, entered into a 1957 contract with CORCO to purchase 1,667 b/d of a "concentrate fraction." The contract term is twenty years and the price of the concentrate fraction is "120% of the posted price for No. 6 fuel oil plus 10¢ a barrel." This contract provided Carbide the material for the production of ethylene oxide and ethylene glycol. Carbide now has under consideration at Ponce a plant which is scheduled to produce 110,000,000 pounds per year of polyethylene and which is reputed to cost $29 million. Carbide has plans to augment the supply of olefins by installing a steam cracking unit to operate on Venezuelan naphtha. It has perfected

arrangements with the Department of Commerce and the Oil Imports Administration to have the naphtha cracker declared a "free trade zone." However, it is understood that Carbide is still holding back on actual construction; giving as a reason the state of the polyethylene market. CORCO announced the building of a multimillion-dollar plant to produce naphthalene from its refinery streams and Stepan announced the construction of a $7 million phthalic anhydride plant to utilize this naphthalene. These plans were later abandoned. Nothing is known of the petrochemical plans (if any) for the Caribe refinery.

More Crude Oil Could Be Imported to Puerto Rico under Certain Conditions

While the economic and political tension created in the United States as a result of the importation of foreign crude oil to supplant domestic crude oil production has thus far made it practically impossible for any refiner to secure a substantially enlarged import quota for utilization in a refinery on the mainland, it may be possible to secure a license to import more crude oil (or naphtha) to Puerto Rico to support a new refining-chemical complex.

Puerto Rico's favorable situation in this regard arises because:

1. It is economically infeasible to move domestic crude in United States flag tankers to Puerto Rico, refine the products and then return them to the United States for sale.

2. Because of the tenseness of the Latin American situation and the tender regard the United States Government has shown for the Commonwealth of Puerto Rico, officials of government in Washington are inclined to favor Puerto Rican developments in every way.

3. Particularly with regard to chemical projects, it can be argued that Puerto Rico must import petroleum for them if it is to continue to progress. Mainland manufacturers of petrochemicals have a wealth of crude oil to draw on, as well as unlimited supplies of natural gas. Hence a literal application of import restrictions to Puerto Rico would block further petrochemical progress there.

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Necessary Criteria for a New Project

It is not economically feasible to build a refinery-chemical complex on the island in order to provide some additional petrochemical raw materials unless, at the same time, it is feasible to find a market for the "regular petroleum products" (gasoline, kerosene, No. 2 oil, No. 6 oil, etc.) which would necessarily be produced by such an operation.

It should be noted that the two existing refineries were planned and built before the import restrictions became mandatory, and both of them depend for their economic life on a series of "back-to-back contracts" with major oil companies. These companies sell Venezuelan crude to the Puerto Rican refineries and buy back approximately the same barrelage of products. Only a few of the major oil companies (such as Esso, Texaco, Mobil, Shell, Phillips, Sun and Gulf) are involved with the present Puerto Rican refining operations. The principal advantage to them in the relationship is that these refineries do have assigned import quotas and when the crude oil is once brought into Puerto Rico, there is no legal question about moving products into the United States. Most of these companies have (1) adequate refining capacity on the mainland and (2) more Venezuelan crude than they need. But they do not have import allocations adequate for their purposes.

It is believed that an opportunity now exists to establish a new refinery-chemical complex in Puerto Rico, with the ardent support of the Commonwealth authorities and the tacit support of the Washington authorities. It will be necessary, before the project can be financed, to effect "back-to-back contracts" covering the acquisition of Venezuelan crude from oil companies; the sale of the non-chemical products back to those oil companies; and, finally, purchase contracts from companies that would use the petrochemical raw materials.

To succeed, the project must overcome two prime difficulties; (1) securing an import quota and (2) securing a chemical customer. If these steps can be achieved there should be little difficulty in "lining up" oil companies and financing. Obtaining an import quota "in advance" is an enormously difficult task, as will be later discussed. In order to place the project in the most favorable light before the quota request is made, it appears necessary that a complete engineering and financing plan be evolved for a new company and that firm commitments from chemical and oil companies be exhibited as part of a brochure to be exhibited to the

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authorities. The commitment from the chemical company is the most important one because (1) it, too, must expend funds on plant facilities in Puerto Rico and (2) the reality of the proposed chemical enterprise must be displayed to the import authorities.

Size of the Proposed Refinery

Several factors must be balanced in determining refinery size:

1. From the standpoint of securing oil company participation (crude sellers and product purchasers), a refinery handling 100,000 b/d of imported crude oil could be managed easily.

2. From the standpoint of obtaining an "advance quota," the smaller the better. Probably 60,000 b/d is the biggest feasible; with a much better chance if the request is for only 30,000 b/d.

3. From the standpoint of chemical company participation, the refinery, regardless of size, must produce enough of the desired petrochemicals.

4. Unfinished naphtha is in surplus supply in Venezuela as it is in Europe. It may be feasible, economically, to use naphtha, rather than crude oil. If naphtha is usable the import quota required may be as little as 30,000 b/d and the refinery still adequate to supply as much petrochemical raw materials as would ordinarily come from a refinery running 50-60,000 b/d of crude.

Discussion of Crude Oil Imports Restrictions Applied to Puerto Rican Refineries

Both CORCO and the Gulf-controlled Caribe refineries were in existence when the restrictions were promulgated. The subcabinet committee that prepared Proclamation 3279 of March 10, 1959 recognized that Puerto Rico would have to be an exception to the general rules and the proclamation stated:

> "The Commonwealth of Puerto Rico largely depends on imported crude oil . . . and that . . . the adjustment of imports . . . should permit imports into Puerto Rico adequate for the purposes of local consumption, export to foreign areas; and limited shipment of finished products to the continental United States."

The proclamation and the subsequent regulations enunciated the policy (see Proclamation, Section 2 (d)) that the maximum import level should be the 1958 level

> "as determined by the Secretary . . . consonant with the purposes of this proclamation or such higher or lower levels as . . . are required to meet increases . . . in local demand or demand for export to foreign areas."

While Puerto Rico is part of the United States and there is no legal bar to the movement of any quantity of its petroleum products to the mainland, there is nevertheless a practical political bar to unlimited product movements. This arises from the fact that the import authorities have extracted promises both from the refiner and from the Commonwealth government that only a certain percentage of the refined products will be moved to the mainland and that the rest will be used locally or exported. It is difficult for the two refineries now in Puerto Rico to build up profitable export business because world prices, generally, are below U. S. prices.

Cordell Moore, Oil Imports Administrator, stated informally that while the import regulations (or proclamation) might possibly be revised to accommodate a new petrochemical complex in Puerto Rico, it was obvious that the U. S. regulation would not be changed to accommodate one new enterprise and that if the regulations were changed at all the change would apply to all enterprisers. This is a valid point but it does not follow that the Puerto Rican authorities would permit the building of any enterprise of which they did not approve.

Opposition to Be Expected

An expansion of the flow of foreign crude oil into Puerto Rico would doubtless be opposed by the mainland petroleum industry producers and refiners. Those advocating a lessened flow of crude oil into the United States would argue that increase of the flow of imported oil to Puerto Rico is just as bad as an increase in the flow to Philadelphia; particularly when the products therefrom are shipped to the mainland. Those companies owning foreign crude oil and moving it to their own East Coast refineries to supply their own markets may argue that--so long as import restrictions prevail--the net effect of increasing the importation of crude oil to the new project in Puerto Rico is to (a) reduce their quotas and (b) transfer the refining project from their refineries to the new project. In all probability no frontal argument will be made against expansion of the Puerto Rican petrochemical industry as such.

The Puerto Rican Arguments
In Favor of Such a Project:

The Commonwealth could produce sound answers to opposition, somewhat along the following lines:

As to the petroleum products shipped to the United States, the following figures are of interest:

The population of the mainland United States is 178,500,000 and its refinery capacity is 10,000,000 bbls. per day or .056 daily barrels per capita.

The population of Puerto Rico is 2,350,000 and the capacity of its two present refineries is 88,000 bbls. per day (restricted somewhat by quotas) or .033 daily barrels per capita.

Drawing a closer geographical comparison, the East Coast area (Census Bureau's New England, Middle Atlantic and South Atlantic States) has a population of 70,650,000. In 1960 it used 1,400,000 bbls. per day of gasoline. Based on a 45% yield of gasoline from crude oil, the East Coast uses the output of about 3,110,000 bbls. per day of refining capacity (1,530,000 bbls. per day located on the East Coast and 1,580,000 bbls. per day elsewhere; mostly Gulf Coast). On this basis, the East Coast area has available about .044 daily barrels of refining capacity per capita.

Of course, it could still be argued that Puerto Rico should not refine more crude oil than it can use on the island but there are many arguments contra:

1. There is no governmental regulation extant that prevents the building of refineries on the mainland and there is plenty of crude oil available there. Why discriminate against business in the Commonwealth?

2. The argument that Puerto Rico does not need a refinery because its citizens cannot purchase and use all of the products from the two refineries already there is similar to an argument that it shouldn't encourage the building of a pants factory because its citizens can't buy all of the pants.

3. The practical effect of opposing the granting of a license to import crude oil to the new project is to stifle the growth of a petrochemical industry in the Commonwealth. (No alternate raw material--i. e.--natural gas--is available on the island.) The stimulation of petrochemical industry in Puerto Rico is just as important as the stimulation of other industry.

4. Unless a license is granted, the Commonwealth will be put at a specific disadvantage as compared to the mainland because its growth in the petrochemical field will be stymied by a regulation that does not in any way retard competition on the mainland. There is plenty of domestic crude oil and domestic natural gas available on the mainland to support any conceivable expansion of petrochemical manufacturing. If at some future date--say--five years from now--it is determined that restriction of crude oil imports is no longer necessary for national security and, hence, is lifted; then the Commonwealth petrochemical industry will have been "frozen" for five years during which the mainland industry will have advanced.

5. At the time of issuance of the proclamation, the petrochemical industry on the mainland consumed only about 2% of the daily usage of petroleum and natural gas and it is unlikely to consume more than 3% in the foreseeable future. Because the formulators of the policy were concerned mainly with the fuel economy, it is not strange that petrochemical raw materials (mostly gases or highly volatile hydrocarbons and, hence, not easily "importable") were not specifically taken in account. On the other hand, the petrochemical industry is a large one and a growing one.

Bruce K. Brown
May 16, 1962

J-33, Brown Memorandum, May 9, 1962

J-33 ---- 12/13/

E 303

Memorandum of Conference with
Cordell Moore, Oil Imports Administrator,
at His Office in the Interior Building, Washington, D. C.
at 10:00 A. M. on May 9, 1962

Present:

Cordell Moore
_____Snedecker, Assistant to Mr. Moore
Oscar L. Chapman
Bruce K. Brown

On May 1, Mr. Chapman had handed Mr. Moore a brochure prepared by Mr. J. P. Cosa in support of a proposed petroleum-refining-petrochemical complex to be built in Puerto Rico. The brochure included a voluminous but preliminary economic study by Universal Oil Products Company describing an operation to handle 60,000 b/d of imported crude oil; producing normal refined products and petrochemical raw materials. An investment of about $60,000,000 was indicated. The rest of the brochure included a tentative outline of a financing scheme and corporate plan, a discussion of the Puerto Rican economy and the petrochemical business, a discussion of plant sites and arguments in favor of the project. The brochure indicated that the Puerto Rican Economic Development Administration would support the plan.

In compliance with Mr. Chapman's May 1st request, Mr. Moore and Mr. Snedecker had reviewed the brochure to prepare themselves for the meeting of May 9th. The brochure was returned to Mr. Chapman at the end of the meeting.

Messrs. Chapman and Brown proposed that the discussion be based on the assumptions that the project would not be submitted formally to the U. S. Government unless and until it met certain standards, as follows:

1. a chemical manufacturer was committed to buy the petrochemical raw materials and utilize them in Puerto Rico when the refining unit went on stream;

2. oil companies were committed to provide the necessary petroleum raw materials and to offtake the refined petroleum products;

3. a financing plan was perfected; and

4. a complete and reliable management slate was developed.

In discussing the matter, Mr. Moore pointed out that regardless of the merits of such a proposition, there would be no mechanism under the present proclamation or regulations by which the Oil Imports Administration could take any action. If higher echelons in government should decide to take any step to permit the development of such a project, such a step would have to be taken by revising the presidential proclamation and then making an appropriate revision of the imports regulations which he administers. He said that he was obviously not in any position to predict whether any action would be taken nor what the action would be. He expressed the opinion that if a favorable action was taken, it would not be with respect to any specific project. In other words, any amendment of the regulations to permit the development of such a project would be equally applicable to others who wished to develop other projects in competition.

Messrs. Chapman and Brown observed that while they concurred with Mr. Moore's view, they felt that the number of projects actually started in Puerto Rico (assuming that the import regulations had been changed) would remain in the control of the Puerto Rican government so that it did not necessarily follow that the practical effect of the change would be to run from "too few projects" to "too many projects."

The discussion ended with the understanding that it might be renewed if and when the project was placed in form meeting the criteria outlined by Messrs. Chapman and Brown.

Bruce K. Brown

cc: Mr. Oscar L. Chapman
Mr. J. P. Coan

J-35, Letter, Durand to Chapman, May 18, 1962

P. O. BOX 2572
SAN JUAN, PUERTO RICO

OFFICE OF THE ADMINISTRATOR

J-35

E 306

May 18, 1962

Mr. Oscar Chapman, General Counsel
Puerto Rico Chemical Company, Inc.
635 Thirteenth Street, N. W.
Washington, D. C.

Dear Mr. Chapman:

We have had extensive discussions and correspondence with Omega Management, Inc., consultants to Puerto Rico Chemical Company, in the matter of your company's proposed project in Puerto Rico. We are satisfied that consummation of the project would result in substantial and continuing benefits to the economy of Puerto Rico.

Present regulations of the U. S. Oil Import Control Program as they pertain to Puerto Rico preclude establishment of a third refinery utilizing a substantial volume of imported oils. We have discussed this matter informally with officials of the U. S. Department of the Interior and we are hopeful, on the basis of these conversations, that the regulations will be amended so as to make a third refinery eligible to utilize imported oils.

Because petrochemical feedstocks production would tend to redress Puerto Rico's paucity of indigenous industrial raw materials, we wish to assure you of our full support for the project assuming, as we hope, that it in no way conflicts with the basic objectives of the U. S. Oil Import Control Program.

Sincerely yours,

Rafael Durand

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MAY 21 1962

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1 Copy to file

J-36, Memorandum, Hewitt to Keeler,

May 31, 1962

USA 33e - 475
(ED. 4-23-71)

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EXHIBIT
U. S. DIST. COURT
S. D. OF N. Y.

J-36

FPI-NI—9-24-75-50M-4417

PHILLIPS 66

INTER-OFFICE CORRESPONDENCE / SUBJECT:
BARTLESVILLE, OKLAHOMA

May 31, 1962

Mr. W. W. Keeler, Chairman
Executive Committee

Dear Sir:

On May 16, 1962, Mr. Bruce K. Brown, a business consultant and a director of Murphy Corporation, met with Messrs. W. C. Hewitt, A. J. Head, H. B. Hettinger, O. D. Edwards, J. L. Kyser, and C. M. Kittrell. He presented a memorandum concerning the establishment of a refining-petrochemical complex in Puerto Rico. This memorandum is attached.

Mr. Brown's purpose in meeting with us was to determine whether Phillips had any interest in participating in the establishment of such a complex in Puerto Rico. As pointed out in the attached, the real reason for the project would be to furnish a vehicle obtain additional quotas for importation of foreign crude oil.

If such a complex were established, they are thinking in terms of a 30,000-60,000 B/D refinery. Murphy Corporation would take about 5,000 B/D of products for East Coast distribution, with a commensurate ownership in the refinery portion of the over-all deal. Puerto Rican nationals would also be expected to own a substantial portion of the outstanding stock. In addition to Mr. Brown, principals involved in the proposed organization include Mr. Oscar Chapman, former Secretary of the Interior, and Mr. John P. Coan, president of Omega Management, Inc. Omega would receive 1% to 3% of the company for its services. We have available temporarily a detailed report on the proposal prepared by Omega Management.

Such a proposal would require the approval of the Oil Imports Administration in Washington, and the support of the Puerto Rican government. The biggest hurdle would be obtaining necessary assurances from Washington that additional quotas would be granted, with some sort of guarantee that they would not be rescinded. The next big problem would be the establishment of the necessary petrochemical plants.

From our standpoint, the primary reason we would be interested would be to obtain a quota or market for our foreign crude oil production. At this time we are able to bring in all our production, either through the Commonwealth deal or through use of our own quotas or purchase of quotas from others. However, it is anticipated we will develop additional reserves, and in that event our production might exceed our assigned import quotas plus our ability to buy additional quotas or develop other outlets for this oil. Under these circumstances this proposal would be of interest to us.

However, there are some disadvantages in participating in such a venture. The company and the United States at this time have excess refining capacity, and this would just add additional refining capacity to the industry. Such action would not help the

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current over-supply problem in this country. Also, our current plans are to supply the East Coast by Colonial Pipeline. In addition, the petrochemical portion of the complex is deemed to be absolutely necessary to gain approval for the entire venture, and we can find no advantage for petrochemical operations we might locate in Puerto Rico. E 308

Mr. Brown told us he felt we were the last hope for putting this proposition together. We also gathered he is not too optimistic about the chances of success even if we decide to participate. In fact, he commented that the chances of success are probably about the same as in drilling wildcat wells. If we are his last hope, then the deal can probably be put together a year or so hence as well as now. With all the current controversy on crude oil imports, we might be able to do it two years from now whereas we might fail today.

It is recommended that we advise Mr. Brown that we have no interest in pursuing the matter further at this time, but leave the door open to back in on the proposition in the future if our situation should warrant it. Those in attendance at the meeting agree with this recommendation, as does the International Department.

Very truly yours,

WCH:m

W. C. Hewitt

cc: Executive Committee Members
Messrs. Paul J. Parker (r) M. W. Conn
T. L. Cubbage (r) A. J. Head
C. C. Tate (r) H. B. Hettinger
R. W. Thomas (r) O. D. Edwards
Harry G. Fair (r) J. L. Kyser

P.S. The memorandum referred to in the first paragraph is attached to Mr. Keeler's copy of this letter. If anyone receiving copies of this letter desires to read this memorandum, it can be obtained from Mr. Keeler.

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J-37, Letter, Hewitt to Brown,

June 5, 1962

Conformed copy
J-37

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PHILLIPS PETROLEUM COMPANY

Bartlesville, Oklahoma

June 5, 1962

Mr. Bruce K. Brown
1416 Oil and Gas Building
New Orleans, 12, Louisiana

Dear Bruce:

I would like to thank you for the time you spent with us recently discussing the possible establishment of a refinery-petrochemical complex in Puerto Rico.

We have discussed the proposal at length and have concluded that under our present circumstances we have no interest in pursuing the matter further at this time. However, it is quite possible our situation could change in the future, and we would propose that we keep in touch as often as our individual situations merit.

It was good to make your acquaintance.

Sincerely,

W. C. Hewitt

J-38, Memorandum, Coan to EDA,

October 25, 1962

OMEGA MANAGEMENT
INCORPORATED
230 PARK AVENUE • NEW YORK 17, N. Y.
LEXINGTON 2-2929

E 310

October 25, 1962

Confidential

Mr. Ivan Irizarry
Commonwealth of Puerto Rico
666 Fifth Avenue
New York, New York

Dear Ivan:

Status of Puerto Rican Petrochemical Project

As has been explained to all individuals and corporations concerned, Omega Management does not engage in the solicitation of primary financings. After the Gibbs group dissolved because of lack of funds and internal dissension, efforts were made to bring the Insular Investment Corporation into the project for start-up capital purposes. Mr. Chapman and Mr. Wilson, having failed to agree on a basis for advancing the project, advised that the petrochemical project could be financed on any basis that would be reasonably consistent with the original objectives of forming the company as well as an eventual public offering and syndication.

Accordingly, principals of E. M. Warburg & Company and Kuhn, Loeb & Company were informed of developments. In connection with other matters, members of McDonnell & Company and Hemphill, Noyes & Company were advised of the project. During August, September and October, meetings have been held with these companies concerning the project culminating in meeting Monday, October 22nd, which included the following individuals:

Oscar Chapman, Esq.	Chapman and Friedman, Washington, D. C.
Nathan M. Shippee	Prudential Oil Corporation, Chairman
Thomas R. Young	Houston Chemical Company, Vice President - Operations
Peter Shea	Kuhn, Loeb & Company
William Grainger	McDonnell & Company

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Robert Brauns	McDonnell & Company
J. P. Coan	Omega Management, Inc.
Walter Gruber	E. M. Warburg & Co., Inc.
Donald M. Blinken	" " "
John Gould	Hemphill, Noyes & Company

At the end of these meetings and subsequent meetings Tuesday and Wednesday of this week, it has been concluded that this group has sufficient financial and management resources to initiate and process the project. The principals concerned have Mr. Chapman's endorsement.

Others who have been included in these financial negotiations but were not present at the Monday meeting are:

Isaac B. Grainger	Chemical Bank New York Trust Co., Director Safety Industries, Inc., Director Fort Myers Southern RR. Co., Director Hartford Fire Ins. Co., Director Hartford Accident & Indemnity Co., Director New York Central R.R., Director American Manufacturing Co., Director Nichols Engr. & Research Corp., Director Nicholas Engr. & Research Corp., Director
Jansen Noyes	Hemphill, Noyes & Co., Partner American Chain & Cable Co., Director Fishers Island Corp., Director Canadian Petrofina, Ltd., Director Marquette Cement Mfg. Co., Director National Horse Show of America, Treasurer & Director Cuneo Press, Inc., Director D. M. Bare Paper Co., Director Combined Locks Paper Co., Director Cone Mills, Inc., Director American Industrial Leasing Corp., Director

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John M. Schiff	Kuhn, Loeb & Company, Partner Los Angeles & Salt Lake RR., Director Provident Loan Society of N.Y., Trustee Westinghouse Electric Corp., Director C.I.T. Financial Corp., Director Tidewater Oil Co., Director Madison Fund, Inc., Director United States Rubber Co., Director Transoceanic-AOFC, Ltd., Director
Kevin Collins	Private investor currently associated with: Caribbean Aircraft Sales Caribbean Distributors, Inc. P.O. Box 5333 Pta. de Tierra San Juan, P. R.

Mr. Collins is also associated with Mr. Jaime Carrion, son of the Chairman and Director of Banco Popular de Puerto Rico, San Juan, P. R.

The attached letter and statement define the qualifications of the Prudential group.

Yours very truly,

J. P. Coan

JPC:tc
Att.

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J-40, Shea Memorandum of August 8, 1963

Document produced in response to plaintiff's cross-question No. (34) 33 E 316

MEMORANDUM

August 8, 1963

FROM: Michael W. Shea

TO: The File

Puerto Rican Petro Chemical Project

On Wednesday, August 7, Mr. Chapman and myself had lunch with Carstens Slack and Miller W. Conn (see cards attached below) of Phillips Petroleum Company.

The purpose of the luncheon was to give Mr. Conn an opportunity to begin a study to determine whether or not Phillips would take an active interest in the establishment of a chemical project in Puerto Rico. It was felt that the luncheon was a result of Mr. Chapman's conversation with Bob Anderson in New York City.

Mr. Conn pointed out that Phillips has the largest petro chemical output of any major oil company in the United States. He saw no great problem in establishing a plant which would have a greater output of chemicals than petroleum products. He also mentioned the fact that there may be a market in Europe for the petroleum output of the plant. He wanted to explore the feasibility of refining oil from Venezuela and from Algeria - in order to meet the different petroleum demands of the European and American markets. Mr. Chapman presented the problems incident to obtaining a quota and establishing a facility in Puerto Rico in a general fashion. He emphasized the need for a well documented presentation to the oil import board. Mr. Conn took a copy of the present study that we have and Mr. Chapman pointed out the areas in which it has to be improved. Mr. Conn indicated it would be some 30 days before he could make a recommendation to Mr. Keeler (Vice-President of Phillips) as to whether Phillips should take an interest in this project. Mr. Conn indicated further that there was a chemical company which had earlier expressed an interest to Phillips to participate in a joint-venture with respect to a plant of the type here under consideration.

CARSTENS SLACK

PHILLIPS PETROLEUM COMPANY

THE CAPITOL BUILDING
EXECUTIVE 3-3050
WASHINGTON, D. C.

MILLER W. CONN
MANAGER

PHILLIPS PETROLEUM COMPANY
SALES & DEVELOPMENT DIVISION
INTERNATIONAL DEPARTMENT
80 BROADWAY
NEW YORK 5, N. Y.

CABLE: PHILPETE - N. Y.
TELEPHONE: DIGBY 4-3430

J-41, Memorandum and letter, November 7, 1963

November 5, 1943
RWM-23-43

J-41 E 317

New York Office

Mr. Miller W. Conn
New York Office

Dear Miller:

Mr. Jack Coan delivered the attached memorandum to me today, Friday, November 5th, with the statement that copies of this memorandum had been forwarded to Mr. Oscar Chapman and Mr. Jesus Diaz-Hernandez.

Mr. Coan wishes to discuss with you at your earliest convenience, the matter of his remuneration for further work done in connection with the project.

Yours very truly,

R. M. Waldby

RMW:pmb

cc: P. J. Parker w/a
J. C. Allen w/a
R. E. Elliott w/a

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STATUS REPORT

Proposed Puerto Rico Petro-Chemical Operation

To All Concerned:

Meetings have been held in Washington and New York concerning procedures, areas of responsibility and timing for the Phillips petrochemical project. The generally accepted plan for the final preparation of the proposal and its presentation follows. The proposal will contain:

1. A letter summary from the President of Phillips to Mr. Durand outlining the justification for and the advantages to Puerto Rico of the availability of an on-site source of chemicals for the advancement of the general economy of Puerto Rico; next briefly describing the scope of the project and the world-wide marketing considerations that make it possible; finally listing some of the companies already participating with Phillips in the national and international development of the petrochemical industry.

2. A justification section summarizing Puerto Rico's lack of chemical and mineral natural resources, the industrial and commercial implications which result, and the most logical and economical method of improving the situation.

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3. A proposed operations section for a petro-chemical core plant using petroleum fractions from crude oils refined at other locations. An expandable complex is planned, using 50,000 barrels per day of such fractions, of which a minimum of 25,000 barrels will become chemical feed-stocks for use in satellite plants in Puerto Rico, or in world markets while the internal Puerto Rican industry is being developed.

4. A financial section proposing a total investment by Phillips of $110,000,000. in the next few years, on a programmed basis keeping pace with world market developments and requirements. This section will also provide an outline of the economics of the project.

5. An engineering feasibility section, including preliminary considerations concerning site, water and power requirements and other considerations in conformance with the over-all development plan for Puerto Rico.

6. A market research section showing present and projected markets and end uses of chemical products to be produced.

7. An organization and management section delineating plans for ownership participation by Puerto Rican investors, management participation in the Board of Directors and in operations by Puerto Rican executives and citizens, and maximum parti-

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cipation in construction and maintenance of plant and required community facilities by local Puerto Rican industry. In addition, Phillips would welcome the opportunity to assist in the training of required middle management, construction, technical and operating personnel in Puerto Rico for initial and planned plant and market requirements.

The complete proposal, as outlined, will be addressed to Mr. Durand and presented to Mr. Chapman and Mr. Diaz-Hernandez on December 2, 1963. Mr. Chapman suggests that about one week will be required to prepare a transmittal memorandum and to plan presentation strategy. He also recommends that the Phillips letter of transmittal to Mr. Durand be sent through the Chapman office because of Mr. Durand's letter to Mr. Chapman, sent in May, 1962.

A luncheon meeting including Mr. Chapman, Mr. Conn and Mr. Diaz-Hernandez is suggested for a mutually convenient date during the week of November 18. It is also suggested that key Phillips executives such as Mr. Adams, Mr. Learned and Mr. Keeler meet in Puerto Rico with Mr. Durand and the Governor after December 2nd.

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J-42, Letter agreement, November 22, 1963

PPS EXB
FOR F.D.
2-9-72
W.A.

OMEGA MANAGEMENT
INCORPORATED
230 PARK AVENUE • NEW YORK 17, N. Y.
LEXINGTON 2-2929

Duplicate Original

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November 22, 1963

J-42

Mr. Roy M. Waldby, Manager
Petroleum Project Development
Phillips Petroleum Company
80 Broadway
New York, N. Y. #10005

Dear Mr. Waldby:

In accordance with our several discussions concerning the possible development of a new petro-chemical complex for the Phillips Petroleum Company, we offer our services to you to:

1. Secure maximum cooperation from all governmental agencies concerned in justifying, financing, operating, taxation, engineering and trade negotiations.

2. Develop favorable marketing and economic conditions for proposed and anticipated products as well as proposed expansions of operations, whether developed by the Company, its customers, or customers created from other sources.

3. Help provide or train adequate manpower for operation and maintenance of proposed facilities and marketing of chemical products.

4. Assist in providing local managerial, supervisory and investment support as required.

We will use our established relationships, as well as our best efforts to bring this project to a satisfactory conclusion within the next twelve months. We plan to work closely with you and to be available as frequently and in whatever locations you may require.

BEST COPY AVAILABLE

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Duplicate Original

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Mr. Roy M. Waldby 2. November 22, 1963

Our fee for this work is two thousand dollars ($2,000.00) per month plus the out-of-pocket expenses directly incurred, such out-of-pocket expenses to be previously authorized by you. We understand that this arrangement is retroactive to November 1, 1963, and is subject to renewal or cancellation on 90 days notice among the parties concerned. Your signature on the attached duplicate original of this letter is all that we require to make this agreement effective.

We appreciate the opportunity to be of service to you.

Sincerely,

J. P. Coan

JPC:tc

Accepted:

Ray M. Waldby

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